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ON the night of Fourth of July last, a large fire broke out in one of the upper wards of New York, and the chief in command of the district "rang-in" three alarms in quick succession, which brought to his aid so large a proportion of the engines in the city that the fire was easily extinguished. Unfortunately for him, his action left the greater part of the rest of the city improperly protected on a night when fires were peculiarly likely to occur. For this "error of judgment," as his superiors were pleased to call it, but really for political reasons he was brought to trial, and most unjustly dismissed the service. This incident has emphasized the fact that under similar or not very greatly different circumstances the city might again find itself practically at the mercy of incendiaries or accident. The city is able to provide engines and men enough to meet any exigency, but it finds a difficulty in providing engine-houses in those places where it is most desirable to have them, and there seems no immediate likelihood that suitable sites for new engine-houses can be secured; and though there is now in operation a system by which a certain number of extra engines are kept in reserve, stored wherever shelter can be had for them, and which under certain circumstances (when the regular engines are called away or moved-up to the next station) are brought out from retirement, and stationed in the regular engine-houses ready to respond to the next alarm, it is not entirely satisfactory. The Fire Commissioners under these circumstances are considering the possibility of doubling the effective force of the department without increasing the ground-rent paid by the city. It is proposed to re-arrange all the engine-houses so that the basement may contain a second engine, which, standing on a movable platform, could be raised to the first-floor level, as soon as the first engine had been called out. The suggestion is a sensible one, and perfectly practicable: indeed, there is no reason why a third engine should not be stationed in the second story, and there is no reason why the second and third engine should not respond as rapidly as they can to any call coming from their special district, as in this way the force stationed at a single engine-house could take care of most of the fires occurring in its district, and thus prevent delays and the dangers to people in the street which are caused by engines from adjoining districts hastening to the fire. The men and horses for the new engines could be housed in the upper stories, since it is possible to extend the buildings upwards as far as may be necessary, and it is no new thing to keep horses up stairs. If any such system is adopted, it seems to us that one of the engines in each house should be a chemical engine, and that, for obvious reasons, it should be the one to occupy the ground-floor, and be the first to respond to the alarm. Chemical engines have proved themselves much more useful auxiliaries than seemed probable at the time of their first introduction, and certainly have already prevented a vast loss from injury by water.

FOR more than twenty years Boston found Charles C. Perkins a most useful citizen to have within its limits, and his fellow-citizens who knew nothing of him personally were accustomed to seeing his name figure in the lists of committees having in charge any educational movement that had a bearing on the development of art in that city; and they must feel as do those who really knew him, that the carriage accident which last week deprived him of life created a vacancy in the ranks of those who are public-spirited, as well as instructed, that it will be hard to fill. As Mr. Perkins was a man in easy circumstances, he was able to follow his inclination and devote himself to the critical study of art, and his unselfish nature was so well understood that others who might have shared in much of his semi-public work stood one side, with the knowledge that he could and would interest himself in these matters, and that they would be conducted uprightly and intelligently. How soon after graduating at Harvard College, in 1843, he began to devote himself to art we do not know, but he gave some attention to studio work, and acquired considerable skill with water-colors, though his predilection for the use of *gouache* and the labored manipulation of his colors gave most of his work rather the air of oil-painting than of water-color sketches. But it was mainly as critic, writer and lecturer on art that he earned his reputation, rather than by any art-work performed by his hands. In these literary channels he was a busy worker, and besides being a frequent contributor to journals and magazines, he accomplished a more enduring work in the publication of three works, "*Tuscan Sculptors*," "*Italian Sculptors*," and "*Raphael and Michael Angelo*," which are held in good repute both at home and abroad. As literary adviser to both friends and strangers, he often gave welcome assistance, and for a year or two did the same service for the *American Journal of Archæology*, of which he was consulting editor. His private work in a manner concerns mainly his friends and his family, but his public service concerns all of his fellow-citizens. To him was largely due the erection of the Boston Music Hall, and the performances there by the Handel and Haydn Society, of which he was for many years president, of the oratorios, and the other choral music, which made Boston for so many years the musical centre of the country. He was one of the leaders in the movement to establish the Museum of Fine Arts, and was always a member of its board of trustees, and he was peculiarly active in bringing about the introduction of instruction in drawing into the public schools. There are many men who take as much interest in art as he did, many who know as much or more about it; but there are few who know how to make so good use of their knowledge, or of whom, when their turn comes to have their life-work reviewed by the public, it can be said that the community at large sustains a real loss and will not easily find so willing a servant.

EVER since the beginning of the great modern movement which seeks to surround mankind with better sanitary conditions, architects have been forced to acquire an extra-professional interest in everything that relates to the disposal of sewage, and thus have been brought into closer relations with civil engineers, to whom all that concerns the construction and installation of sewers formerly related. As a rule it is in the ranks of the civil engineers that the first instructors of the public and the architects have been found, and the names of some of the pioneers are as familiar to us as to their own fellow professionals. Some of these men have devoted themselves as much or perhaps more to the sanitary condition of the house than to that of the town, while others have fixed their attention mainly on the larger work of municipal water-supply and drainage, and so are not so well known to architects. But the name of Mr. E. S. Chesbrough, who died last week at Chicago, is probably known to many, as that of a man who had gained high rank in his profession, and who in recent years had been called in as consulting engineer by cities in all parts of the country when there was question of introducing a water or sewerage system. We believe we are right in saying that Mr. Chesbrough did not have the suggestive and inventive faculties of some of his contemporaries, and in a certain way adhered to old-fashioned theories, but his work was always thoroughly prepared and carefully executed, and those who employed him might feel that though their works might not embody the latest

"fad" in sanitary engineering, it was nevertheless adequate to the demand to be satisfied. Mr. Chesbrough was born in Baltimore in 1813, and had a thorough training for his profession. Until 1855, he remained in the Eastern States, and amongst other things had a good deal to do with the Boston water-supply both as engineer to the Water Board, and afterwards as city engineer. In 1855, he took charge of the construction of the sewerage system of Chicago, and made that city his home. Perhaps his most notable achievement was the building of the tunnels through which the water-supply for the city is drawn from Lake Michigan, at a point which was supposed to be distant enough from the city to prevent all possibility of future contamination—it may be remarked here that this expectation has not been realized, and just now Chicago is much concerned to discover how it may obtain a purer water than the present works furnish. One of the latest of Mr. Chesbrough's tasks was the planning of the new sewerage system of Newport, R. I.

WE have not enough familiarity with the region about Niagara Falls to know how far the steps that have been taken to make an international park, which began, we believe, with suppressing certain mills and factories along the river, will actually interfere with all attempts to utilize the vast water-power of the river and fall. Probably the most rabid worshipper of uncontaminated Nature would not object to the water's doing useful work for the world, if it can do it in so seemly a way as not to affect his delicate sensibilities, and so probably no injunction will be brought against the work which the Niagara River Hydraulic Tunnel and Sewer Company has incorporated itself to do. The work it is preparing to undertake is a peculiarly interesting and daring piece of engineering, but it seems a possible and reasonable enterprise, in spite of its very extravagance of conception. As we understand it, the Company undertakes to construct an enormous mill-race, in the form of a tunnel bored through the solid rock and superincumbent earth, from a point at the level of the river below the Fall up to a point about a mile above it, and it is said that at this point the head of water will measure about one hundred and twenty feet. From this point the tunnel is to continue up the river for about a mile-and-a-half, grading so as to be about one hundred feet below the surface, the path of the tunnel being about one hundred and fifty yards from the bank. The tunnel constructed, lateral feeders will be driven to the river, and gangs of turbine wheels set up, with all the shafting and gearing necessary for the operation of two hundred and thirty mills, each using five hundred horse-power, for this is the amount of power it is computed can be brought into service by the proposed work. What this amount of energy can accomplish may be appreciated if one can grasp the idea that the new mills will have at their command more power than the combined mills of Minneapolis, Holyoke, Lowell, Lewiston, Lawrence and Cohoes. Furthermore, it is estimated that the cost of the tunnel and its adjuncts will be about one-tenth the sum that has been spent for hydraulic engineering in the cities just mentioned. As we said the scheme seems mechanically practicable, owing to the great improvement made of late years in boring-tools, which can here be driven more economically than anywhere else, thanks to the limitless possibility which the Fall affords of operating them by compressed air. The delicate point of the undertaking would be the connection of the feeders with the river. But with coffer-dams on the outside, and the pressure of compressed air behind an air-lock within the work could probably be accomplished without mishap. The doubtful factors are the probable effect of erosion on the tunnel, and the possibility of getting at the machinery in the tunnel when there may be need of repairs.

IT is reported that work on the electric subways began in New York on Monday, and, so far as the physical fact means anything, the citizens of that city may congratulate each other on the appointment of Mr. Flower as a member of the Commission. But it is very far from clear that anything more than a beginning will be made. There are too many public and private interests at stake to allow it to be supposed that the work is to progress smoothly. Besides the unpleasant suspicions of rank jobbery which have been excited by the manner of awarding the contracts and the character of the men to whom they have been awarded, there is the vexed question of the constitutionality of the law under which the Commission acted, and the great probability that the law did not empower them to do more than examine and report. Then other companies have demanded their right to use conduits of their own, and some of these companies had a real existence before the company which has secured the contract was ever thought of. It is also said that Dorsett, who is to make the conduit tubes, can only do so at the risk of having to defend lawsuits which can, and probably will, be brought against him by those who hold patents for the governing principles which are incorporated in those which he undoubtedly does hold. It bids fair to become a very complicated business, which it is for the interest of all concerned, except the public, to prolong as much as possible.

IT is reported from Chicago that an architect has submitted to the Health Commissioner a scheme for erecting a tower — which has the elastic possibility of twenty-five or fifty stories — which, somewhat after the manner of the burning ghats of India, is to provide a means of disposing of the dead by a species of cremation. The tower, about which would wind an inclined plane, would contain innumerable cells or vaults which could be sold or leased to individuals or families, these vaults being arranged between the outer wall and a central flue or chimney-shaft; this is the most important feature of the plan, for it is proposed to dissipate the odors which would naturally emanate from a necropolis of this kind by keeping a "huge fire" constantly burning at the bottom of this central shaft, with the intention that the vapors should "smell to heaven" and not settle in deadly miasma on the city below. Thorough believers as we are in the desirability and necessity of disposing of the dead by cremation, we do believe that even the hasty Chicagoese will prefer more thorough measures, and will perceive that to submit their late friends to a species of slow cooking, as if they were potted pigeons, would probably have a most unpleasant effect on the appetites of their visitors at least. The ingenious architect declares that all that is required is an "act of incorporation and five hundred thousand dollars." It would seem that a little more money would also have to be provided if the "huge fire" is to burn perennially.

WHAT seems to be an excellent flushing-siphon is described in the *Revue Industrielle*. The siphon may be applied either to a small tank, for supplying plumbing appliances, or to sewers or sewage-tanks, and has the great merit of being of equal bore throughout, without weirs, edges or sharp turns to catch lint or sediment, while, as it could be made in five minutes out of a piece of lead pipe, the cost ought to be far more moderate than that of the devices usually sold for effecting the same purpose. In substance, the new apparatus, which is the invention of Herr Kuntz of Carlsbad, consists of a siphon, the longer leg of which, instead of continuing vertically downward to the end, turns, just before it reaches the level of the open end of the short leg, and runs obliquely upward for a short distance, then turning again and going straight downward to the outlet. This siphon is set in the flushing-tank in the usual manner, with the upper bend just below the top of the tank, and the lower end of the long leg opening through the bottom or end of the tank. The operation of the siphon seems to depend upon the weight of the water held in the little trap which is formed by the upward bend of the long leg. As the tank fills, the water rises in the siphon, compressing the air which is confined between the entering water and the water in the trap. The depth of the trap, which is about one-seventh the whole height of the siphon, seems to be so arranged that the water is not forced out of it by the compressed air until the tank is full, and as soon as the trapping water is pushed out, the water in the short leg of the siphon, released from the pressure which had kept it back, rises into the bend, filling it, and bringing the siphon into action. The flow continues until the tank is emptied as far as the open mouth of the short leg, when a bubble of air enters, the "siphon is broken," and no more water passes over; but that already in the long leg of the siphon falls back into the trap, filling it, ready for another operation. For the subsoil irrigation which is becoming so justly popular as the best way of disposing of the wastes from country houses, there is great need of an efficient and easily-cleaned flushing-apparatus, and in some respects this device appears better suited to the purpose than any other that we have seen described.

EARLY SETTLER MEMORIALS.—I.

"THE PILGRIM."

THE imposing character of the event which the statue of "the Pilgrim," recently erected in Central Park, New York, is intended to commemorate, the influential and representative society that caused its erection, and the great American reputation of the sculptor who made it, all combine to give the statue an unusual interest. We learn from *Harper's Weekly* of June 6, 1885, from what may be considered an authoritative article which accompanies a large wood engraving of the statue, that the New England Society of the City of New York thought that "it would be a fitting and graceful thing to give some visible and tangible sign of itself, to do something which should be an agreeable and symbolic expression of the ideas which, as an association, it is designed to cherish and perpetuate. To this end it was decided to erect, in a suitable place, a piece of sculpture which should represent in an appropriate and artistic fashion some episode, principle or belief, historically or typically identified with the beginning of New England. The idea of a statue of one of the company of the *Mayflower* presented itself, and as it seemed to be a good one, and was adopted, thereupon the committee of the New England Society commissioned Mr. J. Q. A. Ward, N. A., to model a bronze statue of a Pilgrim: not of any particular Pilgrim, nor one of the historic figures of that time, but a presentation of a personality belonging to the period and the spirit of the people who moved in it." The article pronounces the statue to be "a large and honorable achievement, worthy of what it commemorates, and more than worthy of Mr. Ward's reputation and ambition as an artist. It is the best thing that he has done, the completest thing of all that he has executed, and it should be a very gratifying matter to the New England Society that its patriotic and creditable aspirations should have found such an admirable fruition," and adds that "the whole impression it conveys is the spirit of New England fashioning; of a man of convictions, of unbounded resolution, of unswerving loyalty to his own ideas, and surcharged with antiliturgy and fight." It is, however, noticeable that the article says nothing of how the statue represents "a personality belonging to the period and the spirit of the people who moved in it," what particular "episode" it illustrates, what "principle" it embodies or symbolizes, how it is connected with any "belief" indulged in by those who landed at Plymouth Rock, or in what way it represents "one of the company of the *Mayflower*."

The Indian Hunter, Central Park, N. Y. J. Q. A. Ward, Sculptor.

The statue is called "The Pilgrim," but its identity as such is left to the imagination of the observer. As to what the statue really represents, or is, there is, among the other New York journals, a difference of opinion. One affirms that it "represents a Puritan of the early part of the seventeenth century, dressed in the severe garb of his sect, standing erect and looking in the distance with a sweeping and searching glance, as if in half expectancy of his restless Indian foe." Another, that "it is the typical New Englander." A third, that it "is one of the old colony immigrants of 1620, and not one of the later Puritan settlers in the more northern colony of Massachusetts Bay." "Neither a man of the clerical type like Elder Brewster, nor a soldier like Miles Standish, but one who went armed with a gun to defend himself against the Indians, and usually with a Bible to protect himself against the Evil One." Two journals speak of the individual purpose of "the Pilgrim," or what he is doing. They say the attitude represents "one who is on sentry duty and has stopped in his short walk to look for the Indian foe."

Gen. D. Morgan, Spartanburgh, S. C. J. Q. A. Ward, Sculptor.

In all that has been said about this statue, including the oration by Mr. George William Curtis, delivered at the dedication, there is very little definiteness about the Pilgrims, and much mixing of Puritan and Pilgrim. We think we shall find in examining "the Pilgrim," that it is even more indefinite as a statue representing its name, than any attempted description.

As a work of art, it has not been received with that unanimity of commendation given to the sculptor's previous productions. Two other journals limited their reference to it to a detailed description of the costume, the weight and cost of the statue, and the pedestal that supports it. The *Herald* was inclined to be critical, and closes its observations by ranking it "among the half-dozen best public statues in the city." The "Easy Chair" of *Harper's Magazine* [for July] declares it to be "both a truthful and poetic rendering of the Puritan hero," . . . "that will unconsciously but truthfully refine and soften the familiar conception of the Plymouth Pilgrim and the great Puritan body to which he belonged," and that it is "one of the finest memorial statues in the country." The *Critic* is the only paper that has spoken in terms of positive disparagement of the statue. It calls it "a thorough betwixt-and-between," "not conspicuously bad, neither is it remarkably good." "From afar it calls the eye and delights the curiosity with queries as to what manner of manikin it may be." Comparing it with other statues by the same sculptor, it adds, "there is a grim and fatal dulness about them."

General Putnam, Hartford, Conn. J. Q. A. Ward, Sculptor.

The facts on which all agree are that "the Pilgrim" is nine feet high, weighs some two thousand four hundred pounds, and cost some twenty thousand dollars. The size and weight of the four bas-reliefs on the pedestal are also given without any disagreement.

Ra-em-ke, an Egyptian wooden Statuette.

To the ordinary observer the questions of real interest seem to be, What does the statue represent? What has it to do with the Pilgrims? and What are its merits as a work of art?

To us it resembles the figure of a man dressed in old English costume, with a gun, a weapon to which he is evidently a stranger (for no one familiar with it would ever place his hand over the muzzle, especially when it is supposed to be loaded) posing for his photograph. If the statue is intended to represent "one who is on sentry duty," it would be said that he was in a defenceless position and could be easily shot or even kicked before he could get his gun to his shoulder. Sentries have their moments of repose, but the requirements of sculpture, as well as the nature of their duties, do not warrant their posing before an expected foe with every member of their bodies at rest, and their only weapon of defence as far off as they can possibly hold it. This sentry could not be more defenceless, unless he were lying flat upon his back. A sentry's duty is to watch, to be alert, ready to fire the first shot; in a position for immediate action, or in one indicating that he can act. Perhaps this Pilgrim sentry is looking for the kind of Indians who are represented by the "Indian Hunter," in the same park, by the same sculptor. If so, the Plymouth immigrant has no need of fear or watchfulness, and may strut to his heart's content, for this Indian has his hands full in the careful transportation of his bow and arrows, and the zealous guidance of his dog: a cowardly savage creeping away from his victim, rather than a wily foe

approaching him. If this is the kind of Indian that howled around the Plymouth Colony, the conscious indifference of "the Pilgrim," playing sentry, may be accounted for. If it were a sentry in every respect, it would still lack localization and historical connection, for there is nothing about it to show that it has any positive relation to Pilgrim life in Plymouth or anywhere else.

In view of the rich material for sculpture in Pilgrim history, the propriety of selecting a sentry to represent it is as much to be condemned, as this statue is inadequate to make good its name. The necessity of defence against incessant Indian attacks was not peculiar to the Plymouth settlers, but was common to all pioneers in America. It was anticipated by the Pilgrims, and provided for in the person of Miles Standish. Those who are familiar with the pathetic incidents of the Landing, its significant and far-reaching character, and the terrible martyr-life during the first winter after that event, will wonder and be amazed that this statue neither suggests nor makes allusion to anything connected with these things. Yet there is nothing in history that has a greater variety of subject better defined or clearer in its presentation to the artist than the one this statue undertakes to commemorate. If this statue is to be taken as representing a fighting Pilgrim, it is both unjust to and unrepresentative of that body of persons. They were not fighters with fire-arms, and their gun-carrying was confined to a local and soon outlived part of their history, while their really representative victories were gained with other weapons; and all that characterized them as a distinct body of people, all that comprised their spirit and aims was developed to its full fruition by the exercise of qualities and virtues not even alluded to in this statue.

If the statue is intended to represent a Pilgrim, who, under probable conditions can defend himself against the Indian foe, then the unfortunate position of the right hand is alone sufficient to destroy the entire character of the statue as a composition, for the relation of "the Pilgrim" to his arm of defence is the key-note of the statue. If a gun is to be accepted as the proper symbol that connects the Pilgrims with, and represents them in the new world, their sole arm of defence, their emblem of safety and preservation, upon which their victories were dependent, then this weapon becomes an intimate, essential and governing element of the composition of the statue. It is no more an individual and isolated weapon, it has become the refuge, the defence and the safety of all that is in, or has resulted from the founding of a new and beneficent form of government. It is a great and sacred symbol, as significant in Pilgrim politics as the cross in the Christian religion. The artistic relationship that this symbol bears to the figure of "the Pilgrim," marks the degree of design, of comprehension of subject, and the degree of art that the statue possesses.

If "the Pilgrim" is intended to be "one of the company of the *Mayflower*," it fails to make that intention evident, for there is nothing about the statue to show that it had anything to do with the people who made that ship a pathetic part of history. If it is called by that name because it is supposed to be clothed in Pilgrim costume, it again fails to prove its identity with anything peculiarly Pilgrim, for there is a wide difference of opinion in regard to what this costume really was, and a costume, no matter how well reproduced in sculpture, does not make a statue. Pitiful indeed, would be a subject for sculpture if it had nothing in it but the preservation of a costume. Costume is sometimes a minor corroboration of the identity of a statue, but if it has nothing else but its costume to tell what it is, it is then no more than a manikin. A figure resembling the human form, placed in an attitude that has no intelligible meaning, though clothed in old English costume, has about as much to do with the Pilgrims, as a barrel of old English type has with Elizabethan literature.

It has been said that commemorative statues should not be confined to those who have suffered in the cause of justice; but should also include those who have "goaded martyrs to desperation, and driven them into rebellion." If this statue suggests anything, it is one of the "footmen" employed by King James to "harry the Puritans and Separatists out of the land," rather than "one of the company of the *Mayflower*."

Thus far we have spoken of "the Pilgrim," as an illustration of

The Marquis de Lafayette.[1]

J. Q. A. Ward, Sculptor. "The Pilgrim."

[1] The statue of Lafayette is introduced to show the effect costume may have on essentially similar compositions.

delineation of what its name asserts it to be, without special reference to its merits as a work of art. The programme of the New England Society in not wishing to have a statue of any historical individuality belonging to the company of the *Mayflower*, like Carver, Brewster, Bradford or Standish, but "a presentation of a personality belonging to the period and the spirit of the people who moved in it," can be variously interpreted. Its best interpretation calls for an imaginative statue, a symbol in human form, that will embody and clearly represent one of the great events in history, and of a spirit the loftiest that ever actuated a body of human beings. A statue like St. Bruno, by Houdon, or St. Francis, by Cano, statues that are both individual and general, or a statue that "should represent — some episode, principle or belief — identified with the beginning of New England." At least, a Pilgrim, be he saint, sentry or warrior. A work of art, though it has no name. Never was a finer subject to treat, never a broader or richer programme given to an artist.

As a work of art, what has the sculptor produced? "The Pilgrim" as a work of art is, in its conception, meaningless, in its composition, discordant and extravagant; and in its effect pretentious.

It is meaningless, because its composition or attitude conveys no indication that it has any purpose whatever, or is connected with anything in itself as a personality, or outside of itself as representing or alluding to something greater than itself.

It is discordant, because the positions of body, legs and arms do not unite in the performance of any art purpose. It is extravagant, because the body, legs and arms are, in their individual positions, beyond their proper limits in the performance of the purposes for which they are individually and collectively used.

It is pretentious, because the whole composition or attitude is set up as a work of art, though it is not one.

The position of the legs, both bent backward, with the body resting on them, makes a combination not recognized in sculpture as a part of its language, but regarded as undignified and distasteful to both artists and athletes, and only common to weak-kneed youths and men of coarse physical construction. Neither is this position of the legs considered a part of the language of sculpture, unless they are engaged with the body and arms in a transitory and harmonious action, where the arms and body lead or govern the legs, and perform the principal function of the statue. The weak and incongruous legs of "the Pilgrim" are not "the first examples of failure in the handling of these members of the body," by Mr. Ward. It is characteristic of many of his statues. A notable instance is seen in the General Putnam, at Hartford, Conn. Another in the Shakespeare, in Central Park, and still another in the Morgan, at Spartanburgh, S. C.

The position of the body and legs is without the composite support it ought to receive from the arms, and they, failing to give this support, are therefore not only out of harmony with the body and legs, but they are also out of harmony with themselves.

The extravagance of the attitude of "the Pilgrim," and why it fails to produce the impression of dignity and determination may be seen in comparing it with the old Egyptian statue, in wood, of Ra-em-ké. In this statue there is harmony of composition, dignity of presence and art. The dangers and difficulties of employing the legs in positions bending backwards are beautifully shown and well guarded against in the little rude Egyptian statuette in wood. Examples of the bending of both legs backward in their harmonious relationship with the body and arms are seen in the statues of Bichat and Riquet. [See Illustrations.]

The extension of an arm in sculpture is one of the rarely-employed actions of its language. When employed, it concentrates the meaning of the whole statue, and is seen in the expression of command, blessing, appeal, and the consummating periods of oratory. It is essentially an impersonal action, referring to things outside of, beyond and greater than the statue. The extended arm of a pope is the heart-beat of the Roman Catholic world; of an emperor, the ruling of a world; of a general, the command of armies. In "the Pilgrim," it is the care of a gun muzzle.

The perfectly relaxed arm of this statue has about as much to do with the rest of it, as an unused word in a dictionary has with literature. The arm, as a member of the human body, is supposed to be used for some purpose in a statue. When it is in a relaxed position, it may perform the most forcible as well as the most subtle function. It may emphasize repose and dignity, as in Ra-em-ké, or be the starting point of a vigorous action. And the arrangement of the relaxed arm belongs to the highest style of composition. There being no need of the left arm in "the Pilgrim," it is left as a useless appendage to the other parts of the figure.

The attitude or composition of "the Pilgrim" is what is understood among artists as *made up*, and succeeds in producing only the unpleasant impression that the right side of the statue is trying to get away from the left.

Sculpture is no more made by the fanciful placing of the human figure in various positions without the guiding direction of some definite idea, purpose, or conception, than is literature by the use of words without reference to their individual and composite meaning. The purpose of a statue guides the sculptor in the employment of the human figure, as absolutely as the thought of the writer or speaker guides him in the employment of words, and unless the purpose of eth sculptor is expressed in the composition of his work without the help of drapery, it will bear no nearer relation to art than a piece of writing, which depends upon a certain kind of type to express its meaning, will bear to literature.

The best work on this statue is found on the front part of the body above the belt. It comes very near being sculpture, and, if all the figure were as well done as this part, it would be entitled to great praise. There are, however, striking differences of degree. The left arm is badly done, and the half-closed hand is very weak. They both poorly bear comparison with the right arm and hand of the "Farragut," in Madison Square. The work on the knee-breeches and boots shows such determination in copying those articles in the minutest detail, as facts of cloth and leather, that they are robbed of their natural picturesqueness and have become bald reproductions in bronze. The faithful preservation of the cartridge-cases will be far better appreciated by the antiquary than by the artist: the correctness of their reproduction is only equalled by the devices of the cheap French bronze manufacturer, who uses casts from natural objects in place of modelling them from nature. Imitating or copying nature is one thing, and making sculpture out of it is quite another.

St. Bruno. Houdon, Sculptor.

The pedestal upon which "the Pilgrim" is erected is almost as much of a curiosity as the statue. It was designed by Mr. R. M. Hunt, a distinguished New York architect, and is Greek in its style of architecture. If the statue "from afar calls the eye and delights the curiosity with queries as to what manner of manikin it may be," so the pedestal excites a like curiosity as to the kind of architecture produced by a combination of Greek lines and the indigenous grandeur of granite-quarry surfaces. As far as the eye can see this pedestal, and the closer the observer approaches it, the surfaces and lines of the base, plinth and die are obscured and brutalized by the masses of uncut material left upon the sides of these stones. And the supporting dignity which the upper part of the pedestal requires to complete a solid, though not elegant design, is nearly destroyed. If the incongruous composition of the statue should be taken as a guide to explain the reason of this combination of Greek refinement and severity with surfaces of uncut stone that have never formed an element in the development of architecture, however primitive, it would lead to the inevitable supposition that this treatment of the pedestal was suggested by the elevated purity of the purposes of the Pilgrims, and the crude nature of their surroundings on Cape Cod. But what a reason! And what an original point of departure for the exercise of the art of design in architecture. Strange and inartistic as this supposition may be, if correct, the pedestal has still more art in it than the statue, for its scheme is distinct and harmonious, as seen in the preserved lines of the three lower stones, and the completed execution of its upper parts.

The manner of placing an inscription upon a monument, simple and unimportant though it may appear at first thought, is really one of the most puzzling conditions for consideration, though not always beyond the capacity of the common stone-cutter. Here the inscription seems to have been made with the idea of using it for all it was worth; for it can be seen almost as far off as the whole monument can be distinguished, dominating the stone upon which it is placed, impressing the beholder with its undue prominence, and emphasizing the injury already done to the exacting simplicity of the Greek style, by the heavy surfaces of uncut granite.

If the inscription on the pedestal of the Farragut statue is objectionable because of its affected style and the difficulty of deciphering it, that on "the Pilgrim" pedestal is unpardonable, because of its obtrusiveness, to which it obliges every passer-by to submit. Some excuse may perhaps be found for this in the necessity of giving identification to the monument, for without the inscription it would not be known.

T. H. BARTLETT.

A STATUE OF THIERS.—While the French have, during the last three months, been erecting monuments and statues to poets, philosophers, generals and sergeants, and all sorts of personages in want of a piece of stone to perpetuate their memory, it seems that there is lying in an obscure atelier at Paris a statue of a great Frenchman, made and ready for erecting, but for which a stand cannot be found. The statue is that of Thiers, the founder of the Third Republic. Several years ago the late M. Clésinger, a first-class sculptor, finished a statue of Thiers, the cost of which was defrayed by public subscription. The family of the sculptor put the statue at the disposal of the Municipal Council of Paris, but that august body refused to erect it on the Place de la Bourse, the site chosen, or anywhere else, though its erection had been decided upon by a decree of the President on the recommendation of the preceding administration. Now an appeal comes from Marseilles for the statue. But Thiers is hardly going to receive honor from his natal town, for it is proposed to stow away the statue in a museum. Fortunately Thiers, having left something behind him, is not so much in need of a statue as some of those who have recently been honored. — *Pall Mall Gazette.*

AN EDITOR'S TRIP ABROAD.[1]—XI.

AMSTERDAM AND THE TOWNS OF NORTH HOLLAND.

DAY FROM ST MICHEL, DIJON.

THERE is a certain satisfaction to the tourist in getting a little out of the beaten track of travellers, and to the architect there is a great deal of interest in the quiet old towns of Holland. Americans, particularly, who remember well the important part which the Dutch have had in settling and civilizing their own country, feel that they have a sort of birthright in the "hollow land," and the familiar aspect of the streets and houses, paved and built with the brick which is with them also the normal building material, no doubt contributes to strengthen the sensation of being near home which one experiences in Amsterdam, at least, if not in the smaller towns.

Apart from its similarity to what we are accustomed to regard with the respect due to age and excellent family connections, it may be doubted whether the Dutch brick architecture has much claim upon the artist's devotion, and one cannot, in tracing in nearly every old street in Amsterdam something which might have served as a prototype for a detail in one of Mr. Norman Shaw's London houses, avoid regretting that a man of such capacity should have tied himself down for so many years to the prim, featureless style which William of Orange and his court brought over with them from their quiet canals, to help them with its soporific influence in calming the nerves of the much-distracted Londoners. It is true that he has rebelled now against the rules which he imposed upon himself, and his latest brick houses, if they had been erected upon the Heeren Gracht in year of grace 1688, would have brought their author before the burgomaster for a breach of the æsthetic peace of the community, but it would have been better still if he had trusted from the beginning more to his own devices, and less to those of his great-grandfathers.

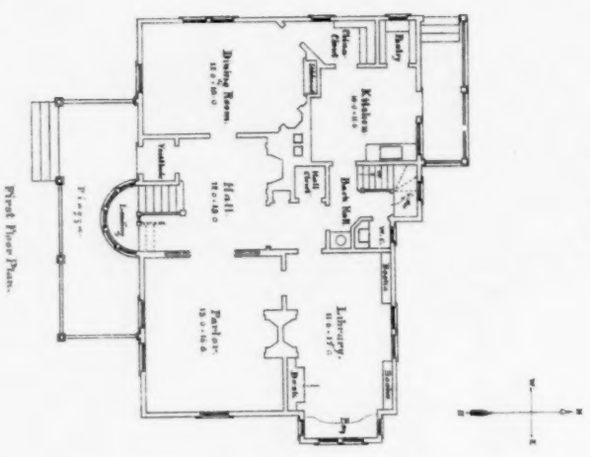
Perhaps the strongest impression given by the old Amsterdam brickwork is that of perfect respectability. It is not very well constructed, for, although the little bricks cling together with astonishing persistence, the houses show many examples of those "arches" of bricks on edge, or, worse still, of those wide openings in the walls, with not even the pretense of an arch over them, which our own ancestors sometimes attempted, so unsuccessfully, to imitate, while the cracked and leaning buildings, and the walls and chimneys tied with iron which one sees on all sides, tell a sad story in regard to the science of their designers; but, however they may bulge and bow, the dark, neatly-painted fronts look always as if their inhabitants had worn ruffs and perukes from time immemorial. A few of the oldest houses show symptoms of a studied proportion of stories and openings, and of a desire on the part of their designers to give them a little character by varying agreeably the sizes and shapes of the windows, and by inserting stone, but they are far between, and with nearly all the openings are arranged exactly as a builder's apprentice would make them, all alike in each story, and equally spaced, and the artistic grace is pasted on afterward in the shape of clumsy festoons, made of cement and stuck on in limited numbers, wherever there was most room for them. In the best houses an inoffensive cornice, with dormers above, terminates the front, but the narrower ones, both ancient and modern, usually have gables, which are mere screens, braced from behind with iron rods, ungainly in shape, and loaded with the coarsest cement scroll-work. In any case the face of the wall which is always of the same rough brick as the interior, and laid with wide joints, is painted as soon as it begins to grow shabby, with a dark slate color, the joints being lined in white or not, as the case may be. The mortar joints are so wide, and the contrast between them and the bricks is so marked, that there is no danger of obscuring them by a coat of paint, but I found in one of the oldest houses that a white line had been put over all the joints, at some remote period, and that this showed through the subsequent coats, which seem to have been rather dressings with colored oil than stratums of paint. In the general painting of the front, the stucco ornaments are not forgotten but receive a coat of white, the same being also put upon the stone bands, key-stones and other decorations, which in the older houses are somewhat liberally used. The basement walls, which are often of smooth slate or marble slabs, need then only a thorough washing to complete the air of decent freshness which the Amsterdam houses, like those in Philadelphia, are seldom allowed to lose. The gloom of the dark paint, even where there is no white stucco or stonework, is nicely relieved by white window frames, and in many houses, particularly the newer ones, the sashes are painted black, forming a narrow, black frame of excellent effect for the white or écru shades, with wide lace edging and insertion, which are commonly used. Several of the less ancient houses, dating, let us say, from the year 1825 or thereabout, have their front windows filled with purple-tinted glass, exactly like that which still survives in some of the old houses facing the Common in Boston, and it seems quite probable that this curious fashion, which appears to have died out completely in a few years, may have been brought to New England from Holland, together with the tiles, and even the bricks, which our grandfathers, and their grandfathers, used to import occasionally. The country around Amsterdam is just what one always fancies Holland to be, a flat, green plain, intersected by endless canals, running off to a multitude of different vanishing-points, and dotted with wind-mills, black-and-white cows, and clumps of bushes, each with a broad, red-tiled roof in the middle; the whole picture being diversified by the shadows of the clouds, which, as in all flat countries near the sea, sweep continually over the sky. There is not much to be said for the beauty of the rustic houses, which are square, one-story structures, with a high hipped roof over them, most of their proprietors making no further sacrifice to the Muse of Architecture than to paint their walls for a space of two feet above the ground of a pale ultramarine color, extending the same decoration, in some cases, to the fences and the trunks of the neighboring trees; but the general effect, to which the beautiful little gardens, and the pretty lace curtains in the windows materially contribute, is one of quiet and intelligent contentment and decency. The picturesque element of the landscape is derived almost wholly from the wind-mills, which profile very effectively against the sky, and are always so numerous in the flat country as to form an important feature of the scenery. We found more than a hundred in view at once from the train, during the few moments that it stopped at a certain little station, and their silent, deliberate movement counts for a good deal in the impression which the country produces upon the traveller.

After one has grown tired, even of the quiet charm of the region about Amsterdam, there is a diversion within his reach, in the shape of a journey to the northern part of Holland. The guide-books write very meagrely on the subject, and I did not know until I had made one trip by railroad, that it might have been done by steamboat on the canals, but as I learned afterward, it may be taken for granted not only that almost any part of Holland may be reached from any other by water, but that such a mode of locomotion is decidedly preferable to travelling by rail. Although the towns of this region, and of Friesland, which faces it on the opposite shore of the Zuyder Zee, are rather too prosperous to suit the sentimental traveller, there is a great deal that is pretty and interesting, as well as old, in them. Friesland, particularly, has the interest to all English-speaking tourists of being the cradle of the Anglo-Saxon race, and the fierce pirates with yellow hair, who divided England among themselves just before their cousins, the Norsemen, came and took it away from them, still live, in a civilized condition, but with their language little changed, in the plains between the Zuyder Zee and the German frontier. North Holland, which faces Friesland, within an hour's sail, is so different, not only in the language of the inhabitants, which does not much concern the tourist, but in the obvious matters of the costumes and faces of the people, and the character of the architecture, that a very pretty amateur lesson in ethnology may be taken in a day, by dividing it between the two provinces.

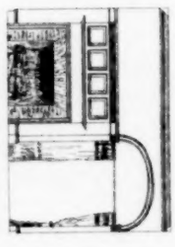
At Enkhuizen, once the most important town in North Holland, we found an unexpected amount of architectural entertainment. About three hundred years ago the city contained forty thousand inhabitants, and was not only the metropolis of one of the most fertile districts in Holland, but possessed a great fleet of fishing-vessels, and the prosperous inhabitants, when they built new houses, adorned them with carved stone and stucco, in a way which seems never to have been known at Amsterdam. Not long afterward the mouth of the Zuyder Zee began to close with silt, and the Enkhuizen fishing-vessels, like the Nantucket whalers, found themselves cut off from their harbor. The citizens followed their ships to other ports, the population diminished to one-sixth of its former amount, and, as no one needed to pull down any of the old houses to make room for improvements, they were let alone, and except for the attrition of two or three centuries of weekly scrubbings, they remain nearly unchanged to this day. Many of them have the date, ranging from 1530 to 1630, either in the ironwork or the brickwork, and the older ones, though not the richest, are generally the most delicately and picturesquely designed. Among the later ones, however, there is a great deal of beautifully-carved semi-grotesque stonework, infinitely prettier and more interesting than the clumsy stucco of Amsterdam.

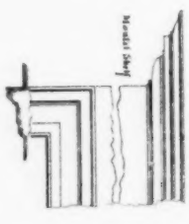
At Leeuwarden, the principal town on the Friesland side of the Zuyder Zee, the character of the buildings is curiously different. We did not have time to stop long at Stavoren, which, although now nothing but a village, is said to have been at one time so rich that the inhabitants locked their doors with bolts of solid gold, and Leeuwarden has always been prosperous enough to pull down its old houses whenever they showed signs of decay, and build fresh ones in place of them; but there is an extremely pretty town-hall, of the sixteenth century, looking much more Scandinavian than Dutch, and a beautiful unfinished Gothic church-tower, which, except for the single circumstance of its being mostly of brick instead of stone, might do duty anywhere in England as a fine specimen of the early thirteenth-century work of that country. Most of the Dutch Gothic architecture that I saw was so deplorable that the sight of this pure and elegant structure was all the more startling, and one could not help wondering whether there might not be a curious story of ancient commercial and artistic relations between the English Saxons and their cousins beyond the Texel, which a closer study of the building could help to disclose. With the exception of these two structures, most of the town is comparatively modern, and the houses, although stone is rather more liberally used in them than in the more southern provinces, and they are more German than Dutch in style, are not particularly remarkable. Friesland, however, is rich in other peculiar characteristics, and Leeuwarden affords an excellent opportunity for studying them. To say nothing of the gold and silver helmets worn by the women, and exhibited for sale by scores in the shop

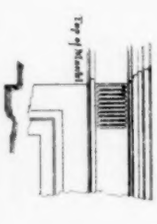
[1] Continued from page 98, No. 557.


Dining Room
Kitchen
Hall
Parlor
Library
Porch
Pantry
Back Hall
Bath
Second Floor Plan.
Nursery
Hall
Over Room
Bath Room
Closets
First Floor Plan.

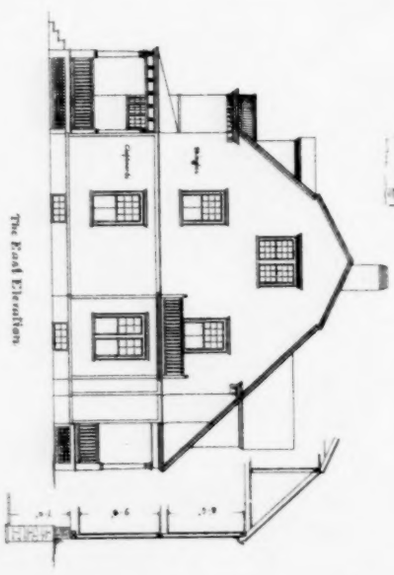
End of Dining Room.

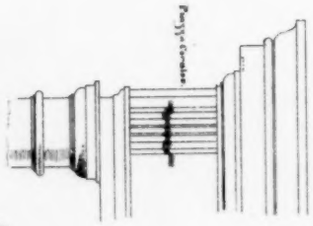

End of Hall.

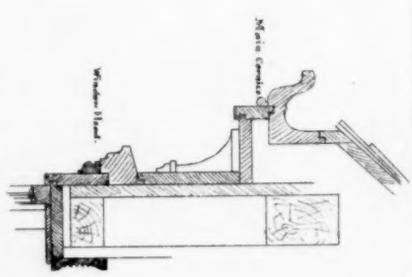

Mantel Shelf


Top of Mantel

Hall Corner


The Roof Elevation.


Portico Cornice


Main Cornice
Window Head.

SCALES
Floor Plans & Elevation
Interior Elevation
Details
AMERICAN ARCHITECT'S COMPETITION
for a $5,000. House for a Novelist
By Doctor Grimshawe.

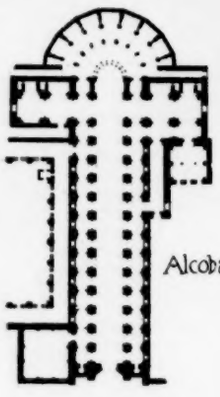
COPYRIGHTED, 1886, TICKNOR & CO.

RIQUET
Rivers, 1859. Souscription Nationale (Bronze)

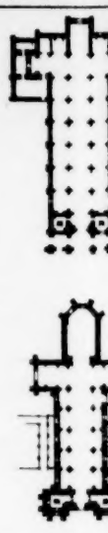
BIGHAT
Sculptor in 1867 à l'Ecole de Medecine Bronze Souscription Nationale

COPYRIGHTED, 1898, TICKNOR & CO.

Pulpit at Coimbra

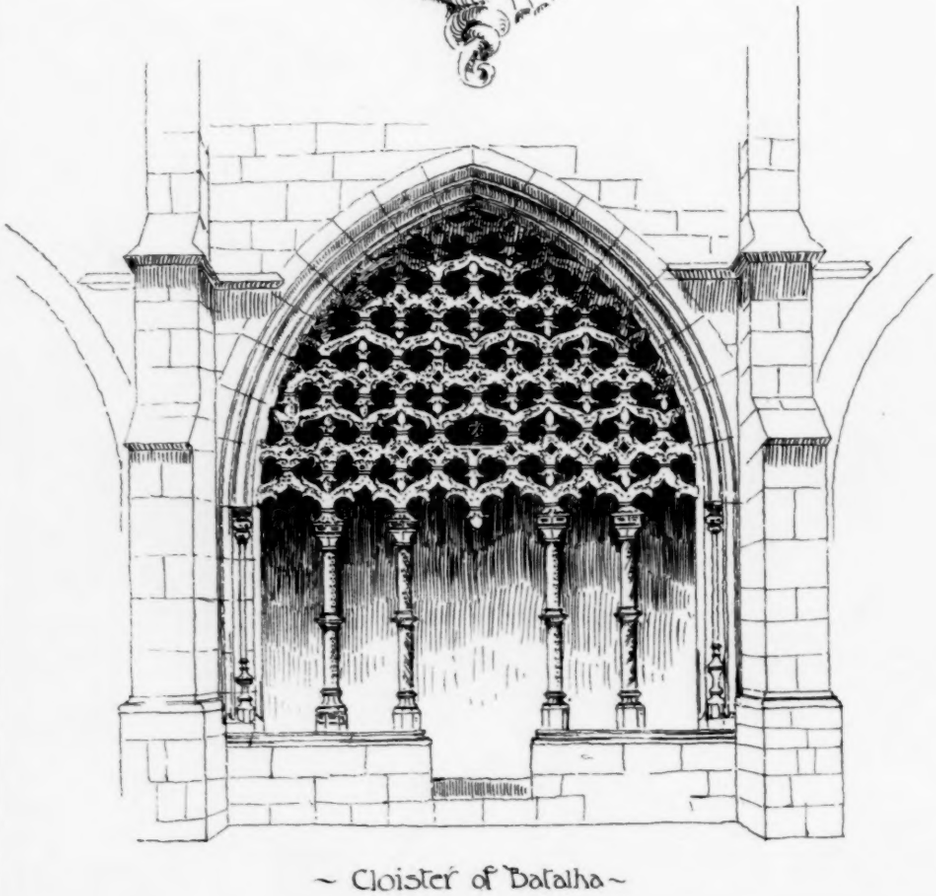


Alcobaca.



PORTUGUESE ARCHIT

~ Sketched by C. H. Blackall ~



~ Cloister of Batalha ~

~ The Church o
B

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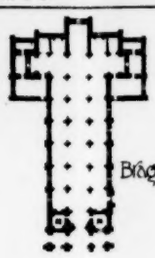
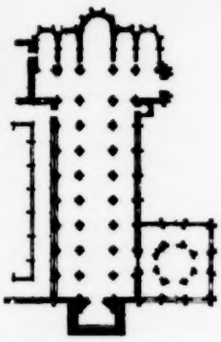
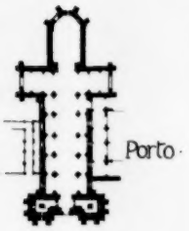


Braga.



Batalha.



Porto.

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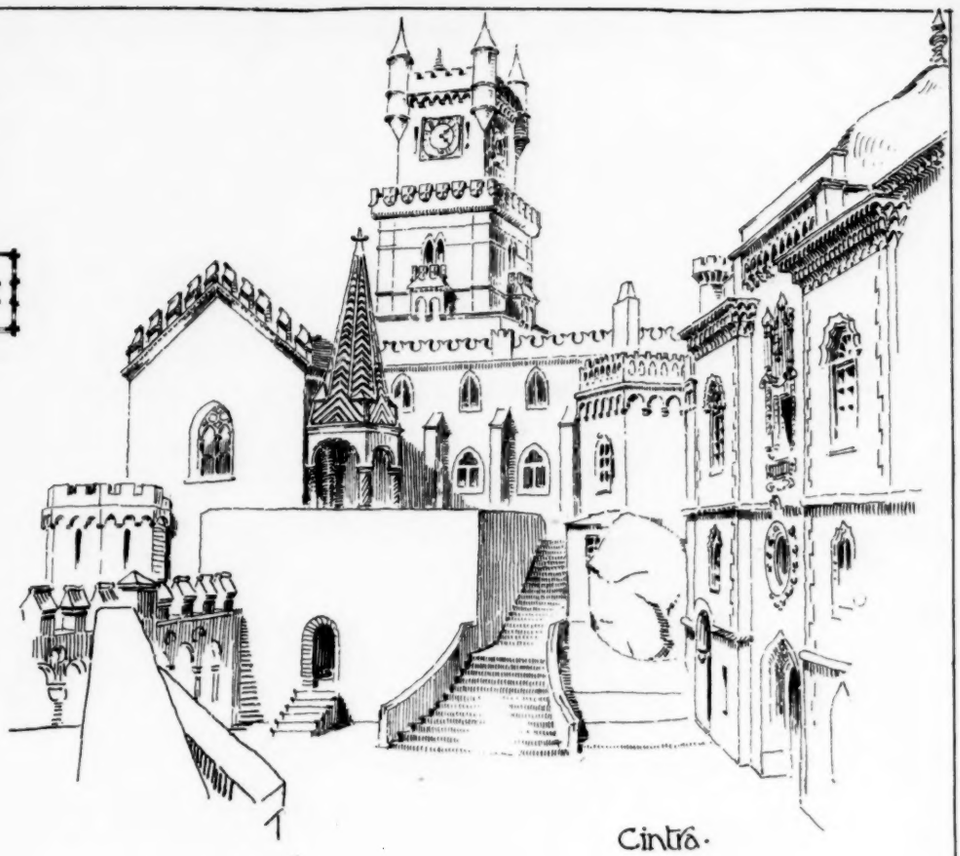
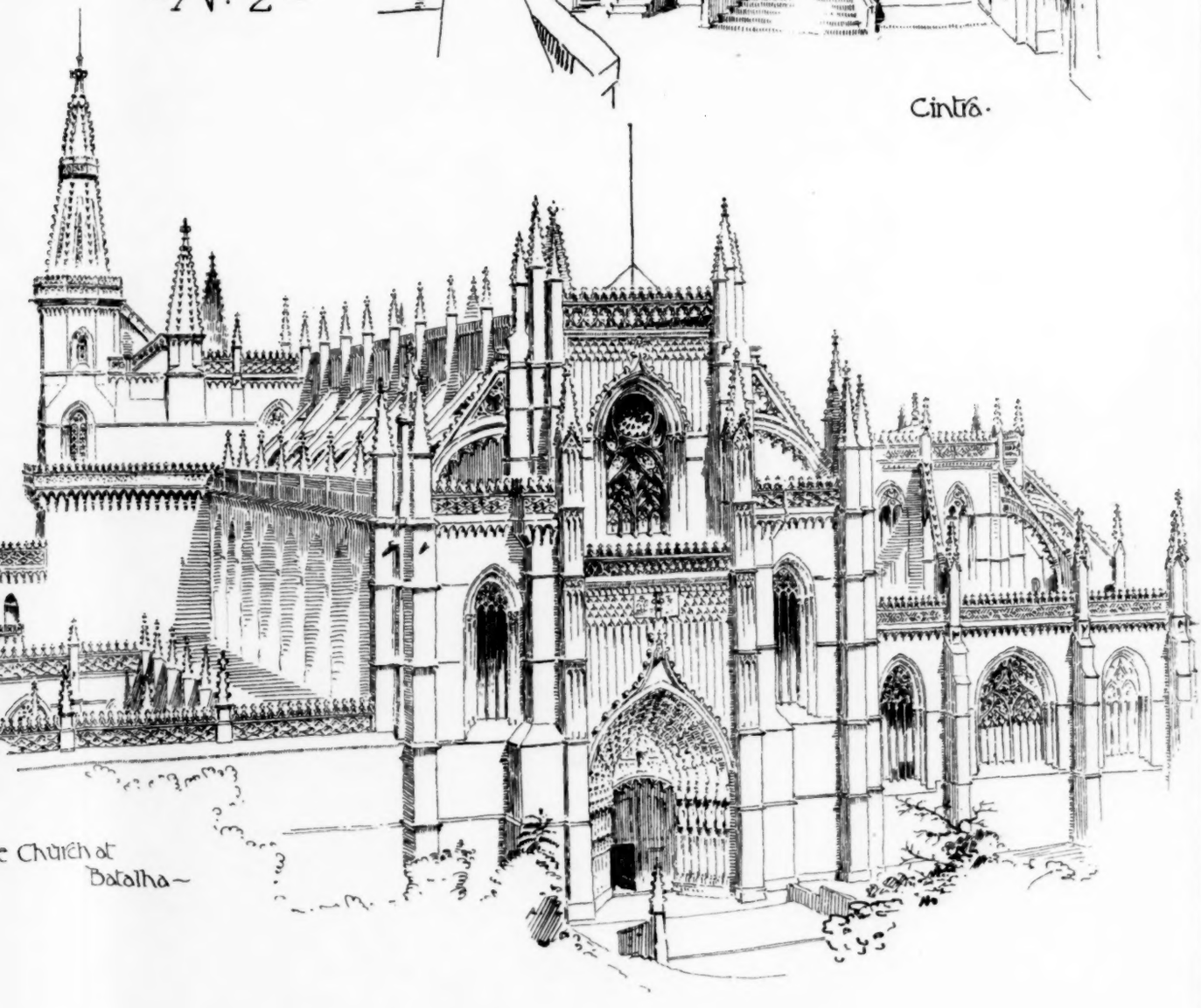
CHITECTURE~

~No 2~



Cintra.



e Church at
Batalha~

Heliotype Printing Co. Boston.

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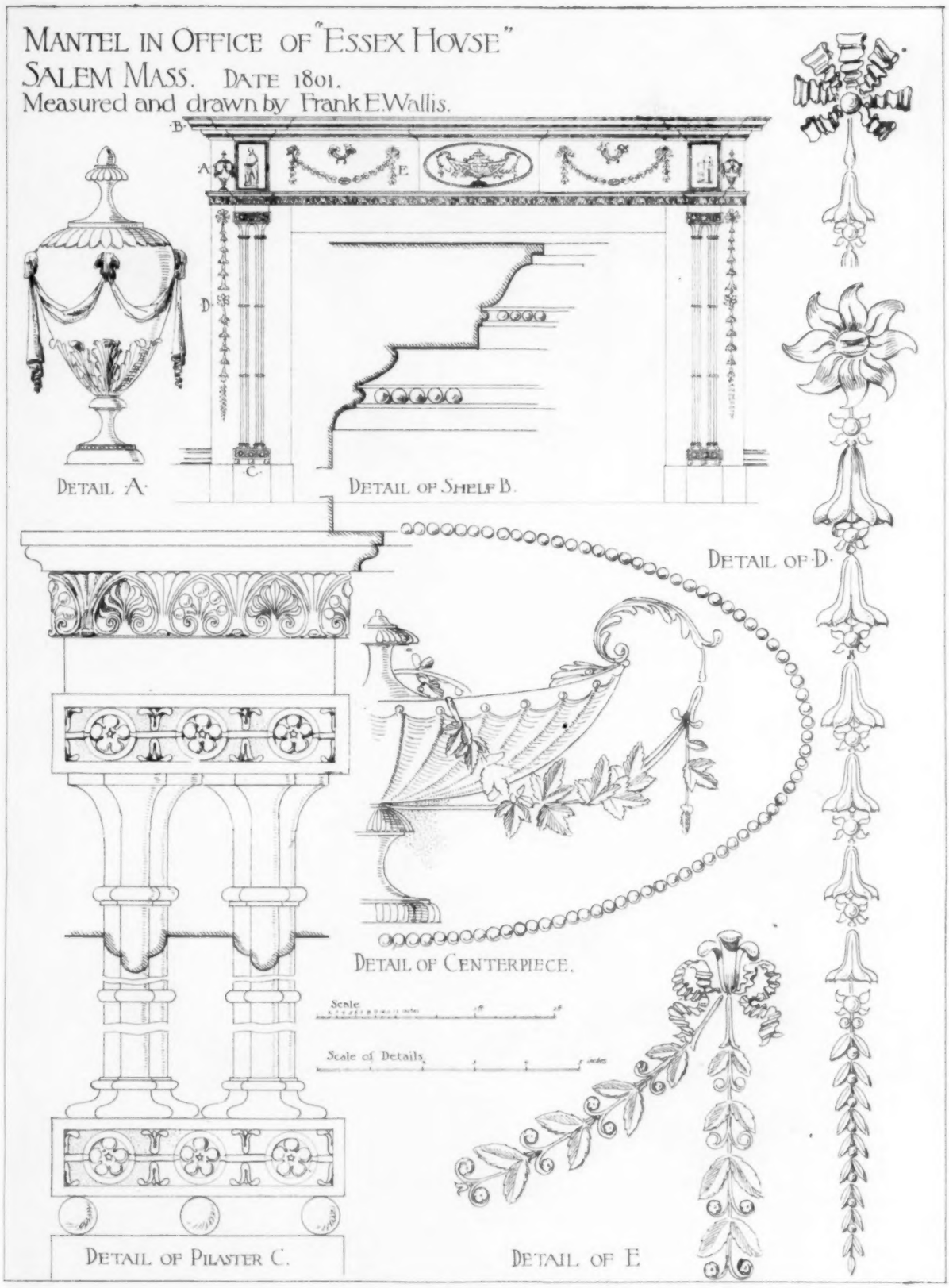


OLD COLONIAL WORK, XIII.

Detail of Gable and Tower

Scale

Arch in Second Story

Scale

Scale of Floor Plans

First Floor Plan

Second Floor Plan

The Front Door

1st Story Doors and Finish

2nd Story Doors and Finish

A Sketch in the Hall showing Retreat

General View from the North-East

Wall Section

Scale

"American Architect" Competition.

For a Novelist's Cottage to cost $5000.00

Submitted by "Pencil Pusher"

Some Details of the Main Stairway

Section A-A

B-B

Finish of C

Scale

Rear Elevation

windows, and the other curiosities of costume, the museum contains a collection of local antiquities of remarkable interest, while the dark little *bric-à-brac* shop not far away offers quite as many more, of a sort that could hardly be found anywhere out of Holland, and are not very common even there.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

COLUMBIA COLLEGE BUILDINGS, MADISON AVE., NEW YORK, N. Y. MR. C. C. HAIGHT, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

OLD COLONIAL WORK, NO. XIII.—MANTEL IN THE ESSEX HOUSE, SALEM, MASS. DRAWN BY MR. F. E. WALLIS.

STATUES OF RIQUET AND BICHAT.

SEE article on "Early Settler Memorials," elsewhere in this issue. The bronze statue of Baron Riquet at Béziers represents him as studying the project of the Canal of Languedoc. The statue of Bichat, a noted physician and anatomist, also in bronze, stands in the court-yard of the Ecole de Medicine, Paris. Both statues are the work of David D'Angers.

SKETCHES OF PORTUGUESE ARCHITECTURE, — II. BY MR. C. H. BLACKALL, ARCHITECT.

FOR description, see article elsewhere in this issue.

COMPETITIVE DESIGNS FOR A $5,000-HOUSE, SUBMITTED BY "*Dr. Grimshawe.*"

COMPETITIVE DESIGN FOR A $5,000-HOUSE, SUBMITTED BY "*Pencil Pusher.*"

MASONRY.	
Excavation,	$67.00
Footings,	16.00
Foundations,	243.75
Underpinning,	165.00
Hatchway or area,	20.00
Piers and partitions,	39.00
Chimneys,	175.00
Lathing and plastering,	251.75
Cellar bottom,	38.00
Drains,	25.00
Cistern,	30.00
Total of Masonry,	$1,070.50

CARPENTRY.	
Frame,	$405.00
Frame covering,	270.00
Roof,	245.00
Cornice,	35.10
Cellar hatchway,	6.00
Windows,	365.00
Dormer windows,	15.00
Veranda,	176.00
Cellar windows,	17.50
Floors,	148.00
Closets,	18.00
Doors,	386.00
Stairs,	178.00
Base,	48.00
Pantry and butler's pantry,	45.00
Kitchen sink, etc.,	13.00
Tank,	6.00
Bath-room,	18.00
Water-closets,	16.00
Mantels and grates,	290.00
Book-cases,	60.00
Wash-stand and slop-sink,	8.00
Cold-air duct,	12.00
Painting,	220.00
Tinning,	46.50
Plumbing and gas-fitting,	305.00
Furnace,	325.00
Total of carpentry,	$3,677.10
Total of masonry,	1,070.50
Total,	$4,747.60

Leaving a balance of $252.40 for miscellaneous items.

AMERICAN ARCHITECT COMPETITION FOR HOUSE COSTING $5,000.[1]—VII.

"*Doctor Grimshawe.*" — Plan ordinary. Exterior details attempt to be Classic, but show great ignorance of Classic orders. Necking of column too high; all beads too large. Interior details somewhat better. Exterior design: it is a pity to injure the dignified, simple, old colonial, gambrelled-roof house by the peculiarly ugly combination of porch and round bay shown in this design. This type of house depends upon its absolute symmetry and proportions and its fine Classic detail for its beauty, and the design has destroyed the first and lacked the second qualification for praise. It is the hardest possible type of façade to design well, and requires a very thorough knowledge and a fine artistic sense, neither of which "*Doctor Grimshawe*" appears to possess. Rendering weak.

"*Pencil Pusher.*" — Waste room in hall. Exterior details: eaves too small; water-table too broad. Interior details: cheap and thin; too many small, square panels. Exterior looks more like a stable than a house. Is thoroughly unstudied; all sorts of different-shaped openings of all sizes placed anywhere. Gable tower especially bad; no sense of proportion, masses, shadow or detail in the design, only an unsuccessful attempt to be picturesque. Rendering fairly good.

"*Simplicity.*" — Plan ordinary. Exterior chimneys are seldom — if ever — good, and never with a window in them. Windows badly proportioned — too high for width. Design needs more projection to eaves, and is heavy and stiff in appearance. Interior details bad; rendering labored and uninteresting.

[1] Continued from page 86, No. 556.

PORTUGUESE ARCHITECTURE.[2] — II.

MANY suppose that there is nothing in Portugal to see outside of Lisbon, unless it be Porto, the city of good wines, and it is not altogether surprising that such an idea should have become current. Travelling through the interior of the country is an exceedingly tiresome and tedious undertaking for any one who has not the plethoric purse and the scornful disdain of large bills which is supposed to characterize the typical American abroad. The single line of railway which traverses Portugal north and south from Vigo to Lisbon, was located so as to carefully avoid all the towns which can be said to have any architecture worthy of more than a hasty glance. Leaving the railroad, one has to depend upon the rudest kind of post-carts, to put up with very bad hotels and to pay extravagantly for everything. To judge by the conditions, only two classes of people travel in Portugal: the very poor, who go on foot, and the very rich who go in their private carriages. But one who has the courage and sufficient money to surmount the impediments to provincial travel through the country will find considerable of value to draw from, and any notice of Portuguese architecture would be quite incomplete which confines itself to the city of Lisbon. Indeed, in the metropolis there is practically only one expression of the national architecture, the church at Belem, as the cathedral has been too often destroyed and too thoroughly rebuilt to offer much of interest aside from the general tendencies indicated by its plan.

The largest religious edifice of Portugal is the convent church of Alcobaça, a small village sixty miles north of Lisbon. The monastery was founded during the latter part of the twelfth century by Don Alfonso of Burgundy, the first sovereign of Portugal. It was built on a very extensive scale. The refectory could accommodate nine hundred monks at table, and the number of cells was as high as nine hundred and ninety-nine. A plan of the church is given on the sheet of sketches. The reason for the excessive proportions of the nave is stated to be the fact that all the monks were obliged to assist at the services each day. Indeed, the disposition of the plan would seem to indicate that the church was designed only for the use of the monks, and was intended to consist essentially of a space for the altar, and a single, long choir. The transepts are so reduced in importance that they seem more like double chapels, the width being only 7.23m, while the total distance across the church at the intersection is 57.60m. The length of the church is 105.30m, and the width of the nave 22.35m. The semi-circular *chevet* and the radiating chapels are a later addition, having been built in 1676, four hundred and fifty years after the church proper was completed. The original termination was probably square. It is worth noting that with the exception of the Lisbon Cathedral there is not a church of any importance in Portugal, antedating the seventeenth century, in which the circular apsis was used. It is the more singular in the present instance as the founder of the monastery was a Frenchman and the five monks who traced the first plans were sent to Portugal from France.

Neither the exterior nor the interior of Alcobaça has any special artistic merit. The style is early Gothic, quite simple in all its parts and somewhat imposing from the dimensions given it. The pointed arch was used for the first time in Portugal in this church. The simplicity of the internal disposition and the comparative absence of the florid overloading which is so prominent in most of the Portuguese churches, show very clearly that although the plan may indicate no foreign influence, French taste presided over the design and left the architecture plain, even at the expense of interest. In the chapel adjoining the south transept is a well-designed tomb enclosing the remains of Don Pedro and Inez de Castro, two royal lovers who are as celebrated in Portuguese literature as Abelard and Heloise have been in France. It is the single piece of richness Alcobaça possesses and is cited as the most beautiful tomb in the kingdom, being carved with the delicacy of ivory and composed with a great deal of taste. In the same chapel is the tomb of Don Alphonso, the ancient law-giver of Portugal.

Twelve miles beyond Alcobaça is the hamlet of Batalha, possessing a monastery and church dedicated to *Nuestra Senhora da Vittoria*, erected in 1388 by João I, in honor of a victory over the Castillians at Aljubarrota, by which the independence of Portugal was assured and the monarchy established on a firm basis. The Portuguese architects are very proud of Batalha and consider it as one of the most perfect types of Gothic art in Europe. Perhaps, that would be stating the fact considerably stronger than most Frenchmen would admit, but the church is certainly a worthy effort and deserves more serious study than it has thus far received. The Portuguese naturally claim it as entirely their own, and with much reason, for Alfonso Henriques, a Lisbon architect, is known to have personally directed the work, and his immediate successor was also a Portuguese. Hence it is fair to consider the plan[3] as being Portuguese, and for that matter, comparing it with the plan of the church at

[2] Continued from page 60, No. 554.

[3] Access was had to the plans which are reproduced with this article, through the courtesy of the Chevalier J. P. N. da Silva, Architect to the King of Portugal.

Alcobaça, erected two centuries earlier, it will be seen that the two are much alike except in the disposition of the choir chapels, and there is nothing at Alcobaça to show that the two plans may not have originally terminated in the same manner. But as to the exterior of Batalha there can be no denying the strong outside influence and it is easily traced. The wife of João I, was Philippa, daughter of the Duke of Lancaster and grandchild of Edward III. According to Murphy, an English architect who visited Batalha in 1789, the design, as far as relates to the façade at least, was inspired from that of York Cathedral, and was due to a certain Stephen Stephenson who was brought from England by the Queen. One thing is certain, that the front of the church is as English as anything could be outside of England, and that whoever made the plans, the design was directed by English ideas.

The church has been so affected by successive earthquakes that the floor of the nave is now several feet below the average level of the surrounding country, and but for the active care of the government the portal would long ago have been choked up with sand. A general view of the church is given with the sheet of sketches. The façade is simple and dignified in its proportions. A wide portal enclosed in a pointed arch and ornamented with a quantity of figure-carvings forms the entrance to the church. Above is a single window corresponding to the clerestory of the nave and on each side a graceful, mullioned opening marks the aisles. The sketch is on too small a scale to indicate the character of the ornament, but the squared sky-lines, the rectangular buttresses and the foliated cornices, as well as the perpendicular fillet ornamentation of the wall-surfaces about the central openings, all reveal the English element of the design. The façade is a very satisfactory one to study, both in detail and in general effect. It seems well-regulated and orderly, the work of a mind which was perhaps a little too accustomed to thinking with T-square and triangle, but which was by no means blind to quiet refinement. It does not impress in exactly the same manner as does the façade of Rheims, or as some of its own possible prototypes in England; but it has a subdued charm which is none the less agreeable by contrast with some of the work which is more purely Portuguese in character. Well would it have been for the national character if subsequent constructions had followed more closely the example so well set forth in this instance. As it was, the monastery church of Batalha exerted a considerable influence on Portuguese ideas and the Gothic which was used in later times leans more strongly to English forms than in any other direction, while even the Belem church, which was the crowning example and the last of the line, retains the flat roof and the rectangular sky-lines of Batalha.

The structure at the right of the façade is the chapel of the founder, completed in 1434 and enclosing the tombs of João I, and Philippa of Lancaster. This chapel was originally crowned by a lofty pyramid of stone after the design of that shown over the transept at the left of the sketch, but it having been thrown down by an earthquake, the government has never yet seen fit to restore it, and perhaps with reason for the general effect of the church is harmonious now and it is doubtful if an aggressive spire at the right would be any improvement.

As will be seen by the plan, the nave of the church is three-aisled The transept is even less pronounced than at Alcobaça and the church ends with five parallel chapels. The width of the nave is twenty-two metres, and the height under the centre of the vaulting 32.46m. The total length from the entrance to the back of the central chapel or choir is 79.39m. A peculiarity of the arrangement is that there is no high-altar, properly so called, each of the five chapels having its altar and the central one being only a little larger than the others and dedicated to the Virgin.

The cloisters which adjoin the church to the north are interesting in detail in a manner which can be but imperfectly shown by the sketch. The two influences, English and Portuguese, are very plainly manifested here. The circumscribing arches, the mouldings, the buttresses and the engaged colonnettes with their caps and bases are thoroughly English; while nothing could be more characteristically Portuguese than the slender, isolated shafts and the fantastic net-work of leaf-like tracery filling the heads of the arches. As an effect of color it is most strikingly picturesque, with its grave, sober setting and its sparkling, lace-like filling. Finely-carved stonework is often compared to lace, but rarely can one find work which so truly fits the comparison as in Portugal, and especially here in this charming cloister. The stone is of a clear, creamy yellow, almost white, which catches every ray of sunlight and emphasizes each shadow, giving a warm lustre to the whole.

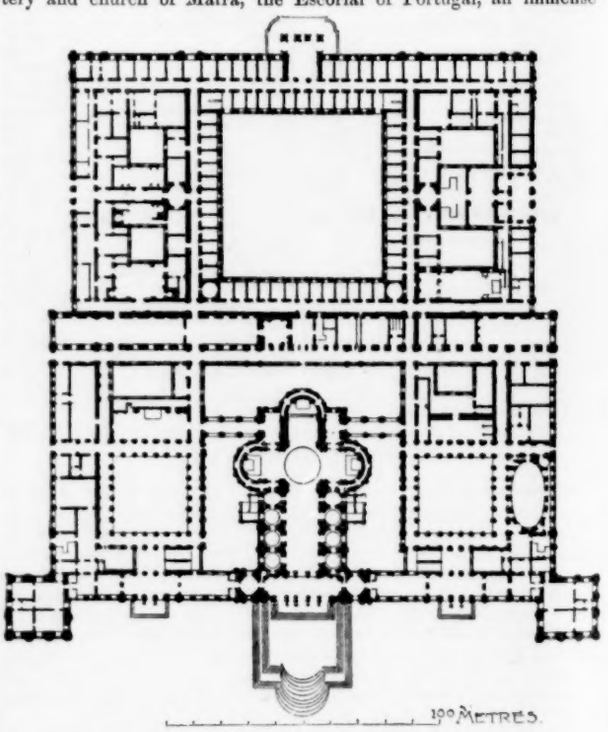
Behind the church is an unfinished chapel in the most florid late Portuguese Gothic, with rich bays carved to the last degree of delicacy and with the beginnings of a hardy vault which was to cover the whole in a single span. This chapel was built by Don Manoël, the patron of Vasco de Gama, and when the explorer returned triumphant from his long voyage the Infante left this chapel as it now stands and taking all his workmen to Lisbon began the erection of the Belem church. The favor which Batalha had enjoyed up to that time began to wane, and the edifice slowly fell into sad neglect. During four centuries no systematic care was taken of it and the monks rather aided the dilapidation by injudicious alterations, but of late years it has been thoroughly restored and is now regularly sustained by the government.

A little over fifty miles to the north of Batalha is the city of Coïmbra, third in importance in Portugal. It is the seat of the government university and abounds in historical associations and souvenirs but is quite poor in architecture, the college buildings offering little of interest and the cathedral being a showy edifice in the Jesuit style. In the convent church of Santa Clara, however, is a chef-d'œuvre well worth visiting, in the shape of a large pulpit, magnificently carved, cut from a single block of marble and built into the wall of the church. A sketch of it is given herewith. The details of this pulpit are really excellent; the seated figures in the niches are full of character and the bas-reliefs and numerous arabesques are sharply cut and spirited in design. The florid fancy which sometimes seems so incongruous when spread over the entire façade of a building is quite in place in this single piece of carving. The pulpit springs from a wall completely covered with fine old glazed tiles in deep-blue figured designs of continuous scroll-work and architectural forms, presenting a most striking and unique effect of color, a combination such as one would find nowhere but in such a country as Portugal.

There are two remaining churches which are worthy of consideration: the cathedral of Braga, the bishop of which is the primate of Portugal, and the cathedral of Porto. The interest in each is chiefly related to the plan. The cathedral of Braga is the most ancient religious edifice in Portugal. A church was erected during the first century of our era, according to tradition, but the foundations of the present cathedral date from towards the close of the tenth century. The building was completed in 1112. During succeeding centuries it was so altered and worked over that all traces of the original style have disappeared, though the plan is believed to be essentially as it was in the twelfth century. The choir, which was made over in the sixteenth century in the style of the convent church of Belem may possibly be a deviation from the original disposition. As will be seen by the plan the cathedral consists of a single, three-aisled nave sixty-eight metres long and twenty metres wide. The transepts disappear almost entirely and the arrangement of the eastern chapels would indicate that this plan was a prototype of the church at Batalha. The exterior of the cathedral is of no artistic value.

The cathedral of Porto dates from about the beginning of the twelfth century, but like the previous example, has been so much modified that only the plan remains of the original edifice, and even this is not entirely certain, as the choir, which in disposition is so widely different from the other Portuguese churches, was built or at least reconstructed during the seventeenth century. The length of this cathedral from the portal to the back of the choir is 64.70m and the width 15.30m.

Eighteen miles to the north-west of Lisbon is the palace, monastery and church of Mafra, the Escorial of Portugal, an immense



Convent Palace of Mafra.

structure erected by the family of Braganza when at the height of power. It was begun in 1717 after the plans of Johann Frederick Ludovic, a German of Italian descent. The style claims to have been drawn from Italian, French and Spanish inspirations, but is practically a severe, restrained variation of the French style which found expression under Louis XIV. The building is really a worthy attempt, being simple and dignified in general treatment without the stiffness and coldness which is so unpleasant at the Escorial, while the proportions are perfectly harmonious and the little decoration employed is correct and scholarly, even if inclined to be slightly monotonous. In fact it is a design over which one could never feel the slightest enthusiasm, though it is thoroughly in keeping with its

character and with the spirit of the age in which it was erected. The stories of the building of this immense edifice make one think of Versailles. Rome, Venice, Milan, Holland, France, Liege and Genoa were set to work preparing details of the ornamentation. During thirteen years, over 20,000 workmen were daily employed about the building, and during four months of 1730, 45,000 persons were inscribed on the pay-rolls. There were days when 2,500 carts were occupied in bearing material to Mafra. It was the first and last truly gigantic building enterprise in which the country engaged.

The plan is admirably arranged to suit the conditions of the problem. The entire façade measures two hundred and twenty metres. In the centre is the church, seventy-eight metres in length; on the right are the apartments of the King, on the left those of the Queen with the state and reception rooms in the two side wings; while in the rear are the cells and apartments pertaining to the monastery, grouped about a large open court.

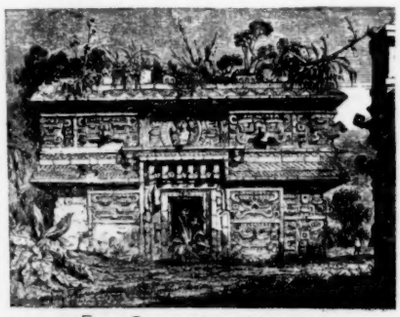
The influence of so important a building upon the architecture of the country was quite marked, and when the great earthquake destroyed Lisbon and Don Santos de Carvalha was commissioned to rebuild it, from Mafra were drawn all the ideas for the new work, and all that has been done in the country since has followed the same general style.

There remains only one building to be noticed. At Cintra, a few miles to the west of Lisbon, is an interesting old convent-castle, picturesquely grouped on the summit of a steep, rocky hill, presenting a pleasing mixture of Gothic, Moorish and early Renaissance and offering a curious picture of what a fortified, mediæval, Portuguese monastery might have been. When the order of the Templars was suppressed in every other country in Europe, the Knights found a lodging and a welcome in Portugal, and they may have aided in the planning of the Cintra monastery, to judge by the shields and heraldic devices which form a portion of the decoration. Don Fernando, the father of the present king, caused the edifice to be thoroughly restored and adopted Cintra as his summer residence. The view shown by the sketch is taken in the outer court and will illustrate the confused and heterogeneous but picturesque character of the buildings.

Portugal can not at all compare with Spain in architectural interest. There is comparatively little to see and what there is must be studied judiciously; but the traveller who is visiting Spain can well afford to spend one, two or even three weeks in Portugal, and will find to reward him an architecture differing in some respects from anything else in Europe, and abounding in ideas capable of being adapted with advantage to quite different circumstances and offering suggestive thoughts well worth taking back to America.

C. H. BLACKALL.

SAFE BUILDING.[1]—VII.



FROM CHICHEN-ITZA. YUCATAN.

The deepest beam the most economical. One thing is very important, and *must be remembered*, that the *deeper* the beam is, the more economical, and the stiffer will it be. If the beam is too shallow, it might deflect so as to be utterly unserviceable, besides using very much more material. As a rule, it will therefore be necessary to calculate the beam for deflection as well as for its transverse strength.

Safe deflection. The deflection should not exceed 0,″03 that is, three one-hundredths of an inch for each foot of span, or else the plastering would be apt to crack, we have then the formula: —

$$\delta = L.\ 0{,}03 \qquad (28)$$

Where δ = the greatest allowable total deflection, in inches, at centre of beam, to prevent plaster cracking.

Where L = the length of span, in feet.

In case the beam is so unevenly loaded that the greatest deflection will not be at the centre, but at some other point, use: —

$$\delta = X.\ 0{,}015 \qquad (29)$$

Where δ = the greatest allowable total deflection, in inches, at point of greatest deflection.

Where X = the distance, in feet, to *nearest* support from point of greatest deflection.

If the beam is not stiffened sideways, it should also be calculated for lateral flexure. These matters will be more fully explained when treating of beams and girders.

COMPARATIVE STRENGTH AND STIFFNESS OF BEAMS AND COLUMNS.

Strength of beams of different cross-sections. The comparative transverse strength of two or more rectangular beams or cantilevers is directly as the product of their breadth into the square of their depth, provided the span, material and manner of supporting and loading are the same, or

$$x = b\,d^{\,2} \qquad (30)$$

Where x = a figure for comparing strength of beams of equal spans.

Where b = the breadth of beam, in inches.

Where d = the depth of beam, in inches.

Example.

What is the comparative strength between a 3″ x 12″ *beam, and a* 6″ x 12″ *beam? Also, between a* 4″ x 12″ *beam, and a* 3″ x 16″ *beam? All beams of same material and span, and similarly supported and loaded.*

The strength of the 3″ x 12″ beam would be

$x_{\rm I} = 3.\ 12.\ 12 = 432.$

The strength of the 6″ x 12″ beam would be

$x_{\rm II} = 6.\ 12.\ 12 = 864$, therefore,

the latter beam would be just twice as strong as the former.

Again, the strength of the 4″ x 12″ beam would be

$x_{\rm III} = 4.\ 12.\ 12 = 576$

and the strength of the 3″ x 16″ beam would be

$x_{\rm IIII} = 3.\ 16.\ 16 = 768.$

The latter beam would therefore be $\frac{768}{576}$ or just $1\frac{1}{3}$ times as strong as the former, while the amount of material in each beam is the same, as $4.\ 12 = 3.\ 16 = 48$ square inches in each.

The reason the last beam is so much stronger is on account of its greater depth.

Strength of beams of different lengths. The comparative transverse strength of two or more beams or cantilevers of equal cross-section and material, but of unequal spans, is inversely as their lengths, provided manner of supporting and loading are the same. That is, a beam of twenty-foot span is only half as strong as a beam of ten-foot span, a quarter as strong as one of five-foot span, etc.

Stiffness of beams of different lengths. The stiffness of beams or cantilevers of same cross-section and material (and similarly loaded and supported), however, diminishes very rapidly, as the length of span increases, or what is the same thing, the deflection increases much more rapidly in proportion than the length; the comparative stiffness or deflection being directly as the cube of their respective lengths or L^3.

That is if a beam 10 feet long deflects under a certain load one-third of an inch, the same beam with same load, but 20 feet long will deflect an amount x as follows:

$$x : \tfrac{1}{3} = 20^3 : 10^3, \text{ or } x = \frac{20^3 \cdot \frac{1}{3}}{10^3} = \frac{8000}{3000} = 2\tfrac{2}{3}''$$

Stiffness of beams of different cross-sections. The comparative stiffness, that is amount of deflection of two or more beams or cantilevers, similarly supported and loaded, and of same material and span, but of different cross-sections, is inversely as the product of their respective breadths into the cubes of their respective depths or

$$x = \frac{1}{b.d^3} \qquad (31)$$

Where x = a figure for comparing the deflection of beams of same material, span and load.

Where b = the breadth of beam, in inches.

Where d = the depth of beam, in inches.

[1] Continued from page 64, No. 554.

GLOSSARY OF SYMBOLS. — The following letters, in *all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.: —

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
$\mathfrak{D}$ = *diameter*, in inches.
$\mathfrak{r}$ = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_1, $a_{\rm II}$, $a_{\rm III}$, etc., or b, b_1, $b_{\rm II}$, $b_{\rm III}$, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance: —

m = moment or bending moment at *centre*.
$m_{\rm A}$ = " " " *point A*.
$m_{\rm B}$ = " " " *point B*.
$m_{\rm X}$ = " " " *point X*.
s = strain at *centre*.
$s_{\rm B}$ = " *point B*.
$s_{\rm X}$ = " *point X*.
v = stress at *centre*.
$v_{\rm D}$ = " *point D*.
$v_{\rm X}$ = " *point X*.
w = load at *centre*.
$w_{\rm A}$ = " *point A*.

Example.

If a beam 3″ x 8″ deflects 0′,5″ under a certain load, what will a beam 4″ x 12″ deflect, if of same material and span, similarly supported and with same load?

For the first beam we should have

$$x_1 = \frac{1}{3.8^3} = \frac{1}{1536} = 0{,}00065$$

For the second beam we should have

$$x_{11} = \frac{1}{4.12^3} = \frac{1}{6912} = 0{,}00014$$

The deflection of the latter beam will be as

$$\delta : 0'',5 = 0{,}00014 : 0{,}00065, \text{ or } \delta = 0'',108$$

Strength of beams of different lengths & cross-sections. The comparative strength of rectangular beams or cantilevers of different cross-sections and spans, but of same materials and similarly loaded and supported, is, of course, directly as the product of their breadth into the squares of their depths, divided by their length of span, or

$$x = \frac{b.d^2}{L} \qquad (32)$$

Where x = a figure for comparing the strength of different beams of same material, but of different cross-sections and spans.
Where b = the breadth, in inches.
Where d = the depth, in inches.
Where L = the length of span, in feet.

Stiffness of beams of different lengths & cross-sections. The comparative stiffness or amount of deflection of different rectangular beams or cantilevers of same material, and similarly loaded and supported, but of different cross-sections and spans, would be directly as the cubes of their respective lengths, divided by the product of their respective breadths into the cubes of their depths or

$$x = \frac{L^3}{b.d^3} \qquad (33)$$

Where x = a figure for comparing the amount of deflections of beams of same material and load, but of different spans and cross-sections.
Where L = the length of span, in feet.
Where b = the breadth, in inches.
Where d = the depth in inches.

Strength and deflection of wooden beams, one inch thick. If it is desired to calculate a wooden girder supported at both ends and to carry its full safe uniform load, and yet not to deflect enough to crack plaster, the following will simplify the calculation:

TABLE VIII.

	Spruce.	Georgia pine.	White pine.	White oak.	Hemlock.
Calculate (x) for transverse strength only if d is greater than	$1\frac{1}{6}L$	L	$1\frac{1}{19}L$	$1\frac{1}{8}L$	$\frac{14}{15}L$
Calculate (x_1) for deflection only if d is less than	$1\frac{1}{6}L$	L	$1\frac{1}{19}L$	$1\frac{1}{8}L$	$\frac{14}{15}L$

Where L = the length of span, in feet.
Where d = the depth of beam, in inches.
Where x or x_1 = is found according to Table IX.

To find the safe load (x) or (x_1) *per running foot of span*, which a beam supported at both ends, and 1″ *thick* will carry, use the following table. (Beams two inches thick will safely carry twice as much per running foot, as found per table, beams three inches thick three times as much, four inches thick four times as much, etc.)

TABLE IX.

	Spruce.	Georgia pine.	White pine.	White oak.	Hemlock.
If calculating for transverse strength only use	$x = 111\left(\frac{d}{L}\right)^2$	$x = 133\left(\frac{d}{L}\right)^2$	$x = 100\left(\frac{d}{L}\right)^2$	$x = 122\left(\frac{d}{L}\right)^2$	$x = 83\left(\frac{d}{L}\right)^2$
If calculating for a deflection (not to crack plaster) use	$x_1 = 95\frac{5}{6}\left(\frac{d}{L}\right)^3$	$x_1 = 133\left(\frac{d}{L}\right)^3$	$x_1 = 95\left(\frac{d}{L}\right)^3$	$x_1 = 100\left(\frac{d}{L}\right)^3$	$x_1 = 89\left(\frac{d}{L}\right)^3$

Where x = the safe load in lbs., per running foot of span, which a beam one-inch thick will carry regardless of deflection, if supported at both ends, and
x_1 = the same, but without deflecting the beam enough to crack plaster; for thicker beams multiply x or x_1 by breadth, in inches.
Calculate for either x or x_1 as indicated in Table VIII.
Where d = the depth of beam, in inches.
Where L = the length of span in inches.

If a beam is differently supported, or not uniformly loaded, also for cantilevers, add or deduct from above result, as directed in matter following Table VII.

Example.

A floor of 19′ clear space is to be built with spruce beams, to carry 100 lbs. per square foot; what size beams would be the most economical?

According to Table VIII, if $d = 1\frac{1}{6}$. $L = 1\frac{1}{6}.19 = 22\frac{1}{6}''$ we can calculate for either deflection or rupture and the result would be the same. If we make the beam deeper it will be so stiff that it will break before deflecting enough to crack plastering underneath; while if we make the beam more shallow it will deflect enough to crack plaster before it carries its total safe load. The former would be more economical of material, but, of course, in practice we should certainly not make a wooden beam as deep as 22″. Whatever depth we select, therefore, less than 22″, we need calculate for deflection only. We have, then, according to Table IX, second column,

$$x_1 = 95.\left(\frac{d}{L}\right)^3$$

If we use a beam 12″ deep, we should have

$$x_1 = 95.\frac{12^3}{19^3} = 24$$

or a beam 1″ x 12″ would carry 24 lbs. per foot; as the load is 100, lbs. per foot we should need a beam $\frac{100}{24} = 4\frac{1}{6}$ wide, or say a beam 4″ x 12″, and of course 12″ from centres.

If we use a beam 14″ deep we should have

$$x_1 = 95.\frac{14.^3}{19^3} = 38$$

or a beam 1″ x 14″ would carry 38 lbs. per foot, we need, therefore, a beam of width

$$b = \frac{100}{38} = 2\frac{12''}{19}$$

or we must use a beam say 3″ x 14″ and 12″ from centre, or a beam 4″ x 14″ and 16″ from centre. For if the beams are 16″ from centres each beam will carry per running foot $1\frac{1}{3}$.100 lbs. = 133 lbs. and a 4″ x 14″ will carry per foot

$$4.x_1 = 4.38 = 152.$$

We could even spread the beams farther apart, except for the difficulty of keeping the cross-furring strips sufficiently stiff for lathing.

Of course the 14″ beam is the most economical, for in the 12″ beam we use 4″ x 12″ = 48 square inches (cross-section) of material, and our beam is a trifle weak. While with the 14″ beam we use only 3″ x 14″ = 42 square inches of material, and our beam has strength to spare. The 4″ x 14″ beam 16″ from centres would be just as strong and use just as much material as the 3″ x 14″ beam 12″ from centres. If we wished to be still more economical of material, we might use a still deeper beam, but in that case it would be less than 3″ thick and might twist and warp. If the beam is not cross-bridged or supported sideways it might be necessary to calculate its strength for lateral flexure. That it will not shear off transversely we can see readily, as the load is so light, nor is there much danger of longitudinal shearing, still for absolute safety it would be better to calculate each strain.

Strength of columns different lengths. The comparative strength of columns of same cross-section is approximately inversely as the square of their lengths. Thus, if x be the strength of a column, whose length is L, and x_1 be the strength of a column whose length is L_1, then we have *approximately*

$$x : x_1 = L_1^2 : L^2, \text{ or } x_1 = \frac{x.L^2}{L_1^2} \qquad (34)$$

Where x_1 = approximately the strength of a column, L_1 feet long.
Where x = the strength (previously ascertained or known), of a column of same cross-section, and L feet long.
Where L and L_1 = the respective lengths of columns in feet.
The nearer L and L_1 are to each other the closer will be the result.

Strength of columns different cross-sections. The comparative strength *per square inch* of cross-section of columns of same length, but of different cross-sections, is, approximately, as their least outside diameter, or side, or

$$x : x_1 = b : b_1, \text{ or } x_1 = \frac{x.b_1}{b} \qquad (35)$$

Where x_1 = approximately the strength of a column, per square inch, whose least side or diameter (outside) is = b_1.
Where x = the strength per square inch (previously ascertained or known) of a column of same length, but whose least side or diameter (outside) is = b.

The more similar and the nearer in size the respective cross-sections are, the closer will be the result. That is, the comparison between two circular columns, each 1″ thick, will be very much nearer correct than between two circular columns, one $\frac{3}{4}$″ thick and the other 2″ thick, or between a square and a circular column. The thicker the shell of a column the less it will carry per square inch. The formulæ (34 and 35) are hardly exact enough for safe practice, but will do for ascertaining approximately the necessary size of column, before making the detailed calculation required by formula (3).

The approximate thickness required for the flanges of plate girders is as follows:

Approximate thickness of flange of plate girders.

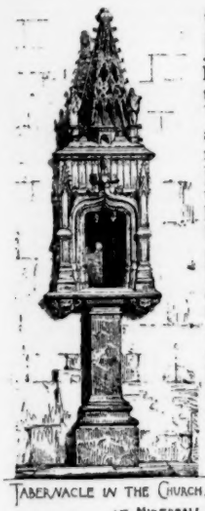
$$x = \frac{\frac{r}{d} - a_1}{b} \qquad (36)$$

Where x = the approximate thickness, in inches, of either flange of a riveted girder.
Where b = the breadth of flange, *less rivet holes*, all in inches.
Where d = the total depth of girder in inches.

Where r = the required moment of resistance at a given point of girder in lbs. inch. (see formula 18.)

Where a_1 = the sum of the areas of the two angles securing flange to web, *less rivet holes*, in square inches.

THE RESTORATION OF ST. MARK'S, VENICE.



TABERNACLE IN THE CHURCH AT MIREBEAU.

SINCE the time when the repairs on St. Mark's excited such furious obloquy and stormy discussion little has been heard, says a correspondent of the *Times*, of the restorations on the great buildings of Venice. One might suppose that they had at that day been inaugurated, and that as a result of the English denunciations the repairs were stopped, while the simple fact is that, according as means permitted, the work has been going on ever since 1840, and that before that at various times the Venetian Republic had restored and rebuilt as the stability of St. Mark's required. A curious evidence of this was three or four years ago brought to light. In repairing the façade of the portico of the church a large stone tablet was removed, disclosing on its hidden face a long inscription containing a treaty between two Cretan cities. This inscription was sent to Professor Comparetti, who recognized in it a lost inscription which was unsatisfactorily transcribed in Venice about two hundred years ago, and has never since been seen, until the recent repairs in the façade of St. Mark's re-discovered it.

The fact is, as I showed in a letter which was a contribution to the discussion above alluded to, that St. Mark's was built by men who were admirable artists, but wretched builders; it was built probably in parts, and without any appreciation of the artistic importance it should one day have, or much care for the elements of stability requisite for the prolonged existence it has enjoyed. In the renewal of the little pavilion at the south-west angle, which is only attached to the church at one side, but serves as a flying-buttress, and bears the thrust of the outer walls of the two chapels on that side, the foundations were found on excavation to consist of piles about six feet long, on which was laid a mass of uncemented rubble a yard or two thick (I do not now recall the exact thickness then stated to me by the architect, now deceased), and on this the bases of the columns were laid. As lately the accusations brought during the old discussion have been authoritatively repeated, and as the work is now being completed, I think it may be worth while to restate the substance of what I then said as to the reasons for demolishing and reconstructing this corner of the church. The wall on the south side of the southern aisle had split from top to bottom from the wretched quality of the material, both brick and mortar, and from the use of sticks of fire-wood, which had been used in the piers as binding material and, perhaps, to save masonry. The mortar had almost lost cohesion, the bricks could be rubbed to dust by the fingers, and the wood had not waited to be rubbed, for nothing but dust remained of it. The outer pier of the south-west pavilion was sinking from the insufficiency of the foundation, and the whole south wall of the two chapels had long been prevented only by extensive shoring-up from falling into the piazza and carrying with it the vault of the chapel, and with it all that face of the south aisle wall which was detached from the inner face by the cleft I have spoken of, as well as everything which supported from without the vault of the south aisle. This crack was getting worse in spite of the shoring and the braces and ties which had been applied from within.

The whole outer wall of the chapels and the entire pavilion was taken down, the brick masonry inside it repaired as well as possible, and solid foundations being prepared, the pavilion and wall were rebuilt, the marbles, which formed a thin shell over the brickwork, and the columns, entablatures, etc., of the original structure being restored as far as the stone cohered still; the vacant places were filled by pieces of the same material as the original where it was attainable, and where not by the nearest substitute for it. The old sculptured material was all preserved intact and restored to its original position. The columns, corroded on the sea side, were turned round so that a new surface was exposed; not an old stone that was utilizable was rejected, and only the incrustation of marble plates was renewed and two or three columns. This was the condition in which I saw it. The Chevalier Meduna, who, with his elder brother, had been in charge of the church for half-a-century and reverenced every stone in it, has followed his elder to the grave, and the works are now in charge of another not less conscientious and reverential architect, Dr. Pietro Saccardo, who has his hoarding now around the pavilion, to complete the work of Meduna by restoring the marble shell in places where the new structure had not in Meduna's day settled to its bearings, and now receives its new coating of marble. Saccardo has gone farther in some details than did Meduna, because he has by diligent search found fragments enough of the various marbles employed by the early builders to be enabled to remove the substitutions made by Meduna, and replace them with material identical with the old—the verde di Genoa by the verde antica, and the grey Italian marble by the original grey Greek. But so difficult to obtain were these, that the latter, which was in the original used in slabs, has been cut into very thin plates, which are cemented on substantial slabs of marble of Carrara, fastened with nickle bolts, and then this compound plate is cemented in its place. The old south wall of the chapel was disfigured by a sixteenth-century tomb which Meduna had removed, restoring the wall to keeping with the whole façade, but in the substituted material. This Saccardo has removed, putting in its place the genuine antique material as elsewhere. The veneering of the south-west angle of the chapel and the south doorway remain to be completed, and the church will then be freed from the scaffolding; but if any person with an eye to symmetry and the grace of the structure will look at the corresponding north-west pavilion, he will see it sinking in the same way below the level of the body of the structure, and only held to it by a complication of iron bars, which drag on the building itself, and make the pavilion to be a burden instead of a support as it should be. This should be corrected; but, as less immediately imperative than the south-west pavilion, so the renovation will make less apparent change, the marbles there being in incomparably better state than were the old ones on the other angle. The only visible external restoration beyond those now mentioned are the correction of the cornice which, with the partial and unequal subsidence of the façade had taken a wavy line more indicative of the picturesque than the stable, and which is now a straight line the entire length of the cornice.

The mosaics of the chapel, against the renewal of which so much outcry was made, have been completely changed, and the old mosaics, which were cleft and riven in scores of fragments, the glass cubes of which they were composed being in many cases wanting at both sides of the fracture for an inch or more in width across the whole subject, have been repaired with the best art of the mosaicist, and replaced on the walls of the chapel, only one composition of the entire series being absolutely irreparable, and being replaced by a new mosaic composed on the very slight indications of the old one. I have just been over the work carefully, and, without the indications of the mosaicist, should not have been able to determine which is the new among the old, so perfectly has the spirit of the design, and the tints of the old been followed. On this point I have the testimony of an architect and decorator of reputation, who, after seeing what had been done, avowed, enemy though he was of the restoration, that the new work was practically in all points as good as the old, though he added, "I would not tell them so, not to encourage them in going any farther."

But, in spite of all partial repair, the cathedral is slowly sinking into "the mud of the lagoons," the tide ebbs and flows up under the great dome, and yesterday I saw the water standing on the floor of the crypt, which was walled in and cemented only a few years ago, it was hoped impermeably. The earth on which the church stands is being slowly washed out by the flow and ebb, and the foundations of the church are unequally subsiding. The old piers of the first church which are under the nave and transept, bearing no weight, do not sink equally, and are lifting the floor into waves, which make it perilous walking on it, and which are increasing perceptibly, it seems to me. Nothing can stop this but the sinking around the entire church of a solid, impermeable wall to keep out the salt water, within which the foundations may be made as stable as the site will permit; or the inner face of the foundations must be laid bare, and the entire area of the church must be excavated and similarly treated, after which the floor-level may be restored, and the pavement, with its invaluable decorative designs, rescued from the destruction it is now undergoing. In many places the mosaics are already effaced under the tread of visitors' feet; the people who stigmatise the restorer of those which have been preserved being among the most eager to denounce any attempt to preserve them by the only means which will suffice, *i. e.*, copying them in solid workmanship while enough of the original remains to follow the design. This is in some places already impossible, but most of the patterns are still practically complete.

I want particularly to insist on the fact, utterly ignored or denied by the denouncers of the restorations, that these are purely structural, only undertaken where the stability of the church is impaired, or the destruction of its decorative qualities threatened. But for the general system of repairs so long going on, the whole church would in all probability have been before this a mass of ruin. In all that has been done there has been, it seems to me, no needless renovation, and the old sculptural work has always been restored to its place without being scraped or cleaned except by washing with water, the plain marbles and undecorated parts of columns being alone polished to preserve the stone from the action of the elements, the old carious surface inviting decomposition. The Republic employed men to scrub the stone and keep it clean from the accumulation of dirt and incipient vegetation which disfigure it and imperil its surface; more than this its successors do not propose, and less they cannot safely do. The Government allows only £2,000 a year for the repairs, etc., of St. Mark's, which is much less than Austria allowed. In my unprofessional opinion this, if insufficient, is, as far as it goes, well and wisely spent. Only an architect can criticize the technical appliances, and this I made no attempt to do; but, as far as the æsthetic result is concerned, I do not see how any fair-minded person who respects the artistic character of the church can find fault with what has been done, if he will only take pains to find out how much and what it is.

COMMUNICATIONS

THE ALLEGHENY CEMETERY COMPETITION.

PHILADELPHIA, Aug. 31, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Our attention having been called to an inquiry in your columns concerning the competition for new entrance to the Allegheny Cemetery at Pittsburgh, Pa., we would inform your correspondent that our design has been selected and that we have been employed to carry out the work.

Respectfully, etc., HENRY A. MACOMB.
JOHN J. DULL.

EYE-BARS.

August 31, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—In the last number of the *American Architect* in the article on American bridge-building you use the term "eye-beam." Some time ago I came upon the same term spelled in the same manner and upon looking it up in books published by Iron Companies I find but one that spells it in this way. Should it not be designated "I-beam" as its sectional shape is like the capital letter I? Would not the word "eye" convey an entirely different shape to one's imagination? I ask for information as opinions seem to differ on this point. Very truly yours, FRANCIS CRAIGIN.

[OUR correspondent must have read as carelessly as he copied. We spoke of eye-bars not eye-beams, and did not refer to I-beams (we follow the accepted usage whenever we have occasion to speak of rolled beams) but to the tension members of trusses which are connected with chords or other members by an eye and bolt.—EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

THE ELECTRICAL TRANSMISSION OF FORCE.—During the last ten years M. Marcel Deprez has been engaged in experiments connected with the transmission of force by means of electricity. The Rothschilds, some time since, provided him with an unlimited credit to prosecute his researches at Creil, under the inspection of a commission of thirty-eight men of science. On Friday the Commission met to hear a report on the results at present obtained, drawn up at their request by M. Maurice Lévy. This report was unanimously approved. It appears from it that we can now, with only one generator and only one receptor, transport to a distance of about thirty-five miles a force, capable of being used for industrial purposes, of fifty-two horse-power, with a yield of forty-five per cent, without exceeding a current of ten ampères. When the amount of force absorbed by the apparatus used to facilitate the recent experiment, but not required in the applications to industrial purposes, is added, the yield will be nearly fifty per cent. The Commission certifies that the machines now work regularly and continuously. The maximum electro-motive force is 6,290 volts. Before the construction of the Marcel Deprez apparatus the maximum force did not exceed 2,000 volts. The report states that this high tension does not give rise to any danger, and that no accident has occurred during the past six months. The Commission is of opinion that the transmitting wire may be left uncovered on poles provided it be placed beyond the reach of the hand. It estimates at nearly £5,000 the probable cost of the transmission of fifty horse-power round a circular line of about seventy miles. This price would, however, be much diminished if the machines were frequently constructed. The Commission, in the name of science and industry, warmly congratulated M. Deprez on the admirable results which he had obtained, and expressed thanks to the Rothschilds for the generous aid extended to the undertaking.—*Correspondence London Times.*

CANADIAN LIGHT-HOUSES.—The annual report of the Canadian Minister for Maine and Fisheries states that the number of light-houses on the Canadian coasts is 526, in addition to 617 fire-signals, 23 steam fog-whistles, and 12 automatic fog-horns. The light-house service comprises the six divisions of Ontario, Quebec, Nova Scotia, New Brunswick, Prince Edward Island, and British Columbia. The Ontario division comprises the fixed and floating light-houses in that part of the Province of Quebec included between Montreal and the frontier line which separates the Provinces of Quebec and Ontario, as well as all the fixed and floating light-houses in the province of Ontario itself—that is to say, the lights on the St. Lawrence above Montreal, and on the Lakes of Ontario, Erie, Simcoe, Superior, Huron, and Georgian Bay. At the end of last year there were 171 light-houses in this division, including 2 in Manitoba, several having been erected last year, and the total annual cost of their maintenance was £14,200. The Quebec division comprises the fixed and floating light-houses of Montreal and those situated lower down the St. Lawrence, on the river Richelieu and Lake Memphremagog, as well as all the floating light-houses, steam-whistles, buoys, etc., in the Gulf of St. Lawrence, the Straits of Belle Isle, and the northwest coast of Newfoundland. When navigation closed for the winter there were in that division 149 fire-signals, 8 floating light-houses, 3 of which were provided with steam-whistles, 7 steam-whistles, or fog-horns, 10 fog-guns, 107 buoys, 59 beacons, and 9 life-boat stations. The annual expenditure in this division is about £28,600. In the Nova Scotia division there are 152 light-houses, 163 fire-signals, 1 floating light-ship, 12 steam-whistles, 8 hand-whistles, 2 fog-bells, 3 fog-guns, 9 automatic signal-buoys, 5 sounding buoys, 84 ordinary buoys, 430 mastheads, and other small buoys, 7 fixed beacons, 8 lifeboat stations, 3 relief stations, and 4 signal stations. The annual expenditure in this division is about £27,400. The New Brunswick division comprises all the light-houses, whistles, buoys, and beacons situated upon the coast and rivers of that province, there being 100 fixed and 2 floating light-houses. The annual expenditure is about £20,000, and £1,600 was spent last year in new lighthouses. In the Prince Edward division there are 45 fire-signals, the total annual cost being about £4,000; while in the division of British Columbia there are 8 fire-signals and a steam-whistle, the annual expenditure being £3,000.—*Building World.*

TRADE SURVEYS

THE continued improvement in the railroad situation over what it was a year ago is the basis for the improving confidence in railroad, manufacturing and business circles. Railroad earnings are improving on all important lines of traffic. July earnings were the most satisfactory for three years. Much is expected to grow out of our anticipated gold importations. Better rates of interest are realized under the expanding demand. The gold movement will be checked so far as artificial expedients will allow. The export trade in cereals, petroleum, provisions, lumber and in manufactured products will be heavy. Importations especially of dry-goods and certain forms of iron and steel will be in excess of last year. The outflow of industrial capital from eastern financial centres to the West and South continues and offers of financial assistance are made from London. The success with which the railroad companies and pools are meeting in maintaining friendly relations is helping on the good order of things. A great many investors imagine that a railway-war means that we have reached the limit of safe railroad construction, an altogether unfair inference. There are at this time demands for upwards of thirty million dollars for railroad building purposes in Wall Street and other financial centres. It is not probable this large sum could be or will be spared at this time, but enough will be spared to make the year 1887 a phenomenal one in railroad construction unless all signs fail. Inquiries have been made for over one hundred thousand tons of steel-rail for next year's delivery, a very significant fact indeed. Fortunately, railroad material cannot advance. Never before in our history were projectors and builders so assured against an advance in prices. In all other seasons of great activity the possibility and probability of sudden and unjustifiable advances acted as a terror to enterprise. Vast enterprises have been handicapped and loss sustained thereby. Trade reviewers overlook this feature of the present situation. There is another to which too little attention is given, viz., that the price of labor, which heretofore has been uncertain, fluctuating between wide limits will hereafter be more constant and fluctuate within much narrower limits. Enterprise can therefore see farther and calculate with more safety. The volume of business is not unusually large at the opening of the autumnal season. The volume of requirements is greater than at any previous period. Demand therefore, whether it be gradual or abrupt, will discover strong prices. Perhaps the safest authority in Chicago on trade prospects says the improvement is gradual only but of a character which denotes further improvement, and like that which preceded the boom of 1881, is likely to culminate in better things than it is at present given credit for. There is a certainty of a good export demand. The demand for all kinds of raw and finished material is good. One plate-glass works (at Creighton, Pa.,) with a capacity of 13,000 square feet per week is refusing orders for delivery before October 1. Window-glass is scarce. Lumber demand is again swelling. Common grades of lumber have been advanced $1.00 per m. at St. Paul, Minneapolis, and other Northwestern points. The period of weak prices has passed in all markets. Buyers are looking up supplies in both Western and Eastern markets before an advance takes place. The sash, door and blind manufacturers and the planing-mill interests generally are sharing in the increasing activity.

House-building activity is the basis of the steady demand and good prices. Large orders for freight-cars are to be given out during the next two weeks. Reliable reports are at hand from the Middle and several Western States to the effect that nearly all the available freight-cars of the several trunk lines are taxed to their utmost capacity to move the merchandise offering for shipment. Hence, there are no fears of the pools going to pieces. Prospects were never better for permanent harmony among the railroads than now, but the uncertain foundation is a satisfactory traffic demand. The demand for machinery is heavy. A score of large establishments have just started to run over-time for a few weeks. Textile manufacturers are busier than ever, and jobbers report greater demand during August than since 1882, when demand was largely stimulated by the fear of advancing prices. The coal production continues in excess of last year, and new territory is developed. Prices are stronger in anthracite than two weeks ago, and producers are predicting a further improvement in October. In real-estate matters, business is dull in Boston, New York, Philadelphia and Chicago. Agents and owners in these and other cities are inclined to hold prices up, in view of the favorable prospects for next year. The views of architects and builders are as heretofore expressed, viz., that the demand for new buildings next year will go ahead of its record this. The permit lists during the last two weeks of August were rather light, and conveyances fell off also; values, however, are improving. It is probable that a speculative movement will be developed in suburban real estate in several Western cities; at least, this possibility is intimated by conveyancers and real-estate lawyers, who have been watching the course of city real estate in the interest of investors and builders. There are no indications that too many houses are being built. In New York city, land is being quietly purchased for extensive operations and improvements next spring. In Philadelphia, certain large building sites have been bid for. In Pittsburgh a reaction from this year's dullness is assured. In the Ohio Valley a great revival will take place early next year. The industries are exceptionally prosperous and the development in the South is shining with a reflected light throughout the Ohio Valley. It is safe to invest in building and in industrial operations. Even in those industries where competition has wiped out margins for a year or two past, improvement is observable. Last year's investments have not been disappointing. Small houses are paying seven to fourteen per cent. Larger houses, five to ten. Material is low and abundant. Labor strikes are causing very little annoyance or delay. Wages will remain stationary for months. No further agitations are contemplated for shorter hours and will not be undertaken in any event except under the auspices of the Knights of Labor, who are known to be not in entire sympathy with the movement.